ANNUAL REPORT

OF THE

DIRECTOR OF AGRICULTURE,

BOMBAY PRESIDENCY

FOR THE YEAR 1884-85.

Bombay:
PRINTED AT THE GOVERNMENT CENTRAL PRESS.

1885.

CONTENTS.

Introductory—

	Para.	Page
Tours	2	1
Removal of the Head-quarters' Office from Bombay to Poona; Appointment of a Survey Instructor; Amalgamation of the Head-quarter and Travelling Establishments; Redistribution of the pay of Clerks ...	3	2

Divisions of Report—

I.—Organization and Maintenance of Village Records—

Extension of the Circle Inspector Establishment to Bijápur; Strength and Composition of Staff; Appointment of Assistant District Inspector; Instruction of the non-survey element in survey and measurement work...	4-9	2-3
Complete boundary-mark inspection considered one of the most important initial duties of the new Staff	10	3
Bhág Kárkúns not reduced in Bijápur—a departure from the Dhárwár scheme...	11	4
Important principle established, *viz.*, that the Circle Inspectors shall not do revenue fiscal work	12	4
Examination of the work done by the Dhárwár Staff	13	4
Circle Inspectors employed by Mámlatdárs on work other than that assigned to them	14	4
Importance of check secured on registration of Crop Statistics and on Statistics of Population and Agricultural Stock	15-16	4-5
Enumeration of the duties of Circle Inspectors	17	5
Compilation of Agricultural Statistics by Circle Inspectors and District Inspectors	18	6
Attention paid to improvement of Statistics. Calcutta Conference. Bombay Presidency Committee...	19	6
Revision of Hope's Manual of Revenue Accounts begun by Mr. W. P. Symonds, C.S.	20	6-7
Strengthening of the District Staff of the Agricultural Department ...	21	7
Proposal to form one Head-quarter Establishment at Dhárwár for the custody of the Survey records of all Kánarese Districts negatived...	22	7
Reasons showing the necessity of the transfer of an Assistant Superintendent of Survey to the Agricultural Department ...	22	7-8
Examination of the Dhárwár Staff in survey and measurement work	23	8
Special test to be exacted from Circle Inspectors in lieu of ordinary Revenue Departmental Examination.	24	8-9
Rules for Recruitment of Circle Inspectors	24	9
Establishment of a Degree of Agriculture under consideration by the Bombay University	25	9
Scheme of sending selected Circle Inspectors to the College of Science as Government nominees under consideration	26	9
Passed students of the Agricultural High School Class eligible for Circle Inspectorships after two years' pensionable service in the Revenue Department	26	9
Provisional Rules for the guidance of Circle Inspectors introduced into Dhárwár and Bijápur with the sanction of the Commissioner S. D.	27	9
Work of the Circle Inspectors will be more properly reviewed by the Collector and his Assistants	28	10

II.—Analysis of Districts with reference to security from Famine—

Information required by Section 17 of the Bombay Famine Relief Code as regards (1) the area liable to famine, (2) the causes, (3) the accessibility for relief purposes, (4) the economic condition of the people, and (5) the approximate number of persons likely to require employment in a famine year, is under compilation	29	10
These special statistical accounts of each District will be distinct from the more detailed "Agricultural District History and Manual" for each District already commenced under the orders of Government	30	10

III.—System of Collection of Revenue and Rental in Precarious Tracts—

Not taken up	31	10

	Para.	Page.
IV.—Measures of Protection—		
(1) Arboriculture—		
Bábhul plantations and Ráb Experiments	32, 34	11
(3) Irrigation—		
Question of extending well-irrigation by reducing the cost of wells and lifts considered and reported on by Mr. F. D. Campbell, Executive Engineer, who was placed on special duty for three months ...	35	11
As a rule, no machinery in the shape of boring tools or dredgers will be of any use	36	12
The rayats are conversant with, and do make use of, when necessary, a very cheap system of well-making which it is impossible to improve upon	36	12
The native water-lift or Môt is more efficient than any other water-lift which has yet been tried into the country	36	12
Government cannot assist the rayat either by teaching him how to build cheaper wells or by introducing improved water-lifts ...	37	12
Merits of various water-lifts, *e.g.*, the double Môt; the Persian Wheel; the Burgess Bucket Lift; Hartford's Windmill, discussed...	38	13
For simplicity and economy none of these water-lifts can surpass the ordinary leathern bag worked by bullocks	38	14
The *Rámio* and the *Sundio* Môts of Gujarát described	38	14
A hydrographic survey to record the depths of water-levels in villages would be of no help	39	14
Important ruling vouchsafed by the Bombay Government to encourage irrigational enterprize	41	14-15
System of dividing survey numbers into subordinate irrigation numbers sanctioned and introduced	42	15
V.—Agricultural Experiments including Farms—		
A.—Experimental Farms—		
Progress Reports of Farms not circulated with a view to maintain the thread of the narrative of operations unbroken through the Annual Reports	44	16
I.—The Bhadgaon Farm—		
Besides the Assistant Superintendent, Mr. Dádina, a Graduate of the Madras Agricultural College, two Madras Graduates are attached to the Farm, one as a Clerk and the other as an Apprentice ...	45	16
Manures—green manure, cow-dung ashes, tillage as manure—discussed	45	16-17
Use of pickles to prevent smut (kanhi)	45	17
Experiments on Sorghum, Maize, Golden Plantains, Italian Turnips, Tobacco, The Divi-Divi Tree, Arabian Date Palms, and the Carob Tree	45	17-18
Live Stock—the Khilári Breed, the Aden Herd and the Sind Dumba...	45	18
Proposal to remove the Aden Herd to Poona	45	18
II.—The Haidarabad Farm—		
The Bhadgaon Forms and Registers introduced; Appointment of an Assistant Superintendent; the Farm laid out anew to suit the requirements of experimental work	46	18-19
Selection of seed begun ten years ago	46	19
Manures	46	19, 20
Experiments on Jowári, Tobacco, Buck Wheat, Mangolds and Carrots, the Bourbon Cotton and Potatoes	46	20
III.—The College of Science Farm—		
Mr. Woodrow appointed Lecturer in Agriculture and Botany at the College of Science; the College Farm	47	20
Experiments on Green Manure, Sugarcane, Jowári and Oats ...	47	20-21
Distribution of Mango grafts carried on at the Farm; long list of famous Mango trees prepared from District Officers' Reports ...	47	21
IV.—The Nadiád Farm—		
A private institution; the prescribed Forms and Registers for the Government Farms accepted	48	21
B.—General Principles of Agricultural Experiment—		
The projects of a Central School of Agriculture and a Central Farm deferred till the recommendation of the Calcutta Conference is accepted	49	21
Reasons for the appointment of a Consulting Agricultural Chemist to the Government of India	49-52	21-22

C.—Special Experiments—

	Para.	Page.
The Crop Experiments made by Revenue Officers form the subject of a separate Report	53	22
Ráb Experiments will be reported when the harvest is reaped. ...	54	22
Corrymony Fence Trial not carried out for want of funds ...	55	22

D.—Experiments on Various Indigenous and Exotic Products—

A.—Indigenous.

I.—Wheat—

Distribution of selected seed in selected tálukás	56-57	23-24
General distributions of seed suspended	58	24
The result of the experiments on the Farms awaited	59	24
The question as to how far the colour, consistency and shape of the grain can be preserved, examined and discussed	60-63	24-25
Trials with Foreign Wheat	64	25-26
Net result of the above considerations	65-66	26
Trial of a Steam-thresher for Wheat	67-68	26-27
Collection of samples of the Wheats of the Bombay Presidency ...	69	27
Statistics of Trade	70	27

II.—Tobacco—

Indigenous Tobacco cured on improved methods at Nadiád by Mr. Jöns; Government sanctioned Rs. 2,500 for the experiment; Samples of cured leaf sent to Europe for the opinion of experts ...	71	27-28

III.—Cryptostegia grandiflora—

The results of the experiments show that the cultivation would not pay even under favourable conditions	72	28

B.—Exotic.

I.—Cotton—

Result of the Dhárwár Experiment described last year not known ...	73	28
The details and merits of this experiment discussed	74	28-29
Results commensurate with the expense cannot be secured ...	75	29
Black-seeded Egyptian Cotton is quite unsuited to the Dhárwár District	76	29
Reasons for the continuance of the Government Saw-gin Factories ...	77-78	29-30
Gins worked by bullock power must be encouraged	79	30
A new pattern of Saw-gin introduced into Dhárwár. The Hand Charak is found in the south of the district	80	30
Cultivation of the white-seeded American variety for distribution at a moderate charge	81	30
The idea of establishing Cotton Markets should not be allowed to drop	82	31
Prospects of American Cotton	83	31
The subject of the admitted adulteration of Khándesh and other Cotton fully discussed	84-104	31-36

Nánkin Cotton—

Has no merit as to staple or yield; all attempts to force its growth should be abandoned	105-107	36-37
Experiments of Jute, Manilla Hemp, the Carob Tree, the Rain Tree, Manilla Tamarind, the Divi-Divi Tree, Arrowroot, Bastard Cedar, Golden Plantain, Italian Turnips, Arabian Date Palms and Maize.	108-116	37-39

E.—Forecasts of Cotton and Wheat—

Summary of the forecast reports sent to the Government of India; Fresh arrangements made to obtain correct and punctual returns...	117-125	39-42

F.—Agricultural and Cattle Shows—

Káthiáwár, Nadiád, Ahmadnagar, Poona, Máheji, Chinchli, Karvati and Mairál	126-134	42-43

G.—Manufacture of Sugar—

Establishment of a Cane Sugar Refinery at Poona	135	44
Manufacture of Sugar from Date Palm juice and Sorghum ...	136-137	44-45
Manufacture of Coarse Sugar in Kolhápur	138	45

H.—Chemical Manure—

Preparation of a highly concentrated Chemical Manure from ashes, lime and ground bones by Professor S. Cooke	139-141	45-46

I.—Ensilage and Fodder—

Results of the experiments made at Poona and in the districts ...	142-158	46-49
Methods of preserving Fodder adopted by the agriculturists ...	159	49

	Para.	Page.
J.—Improved Agricultural Implements—		
Steam Wheat-Thresher, Indigenous Wheat-Thresher of Gujarát, Poona Sugarcane Mill, Bóhia Mills, Massey and Co. Ploughs, Stormont Plough, Royal Plough, American Scythe	160-162	49-50
K.—Value of Ja'mbul in ridding tanks and wells of Moss—		
Experiments made by the Mámlatdár of Kumta in Kánara proved successful. Further experiments are being made	163	50-51
VI.—Cattle-breeding and Veterinary Establishment—		
The Bombay Veterinary College and Hospital have made no progress for want of funds	164	51
Improvement of the breed of sheep and meat-producing animals ...	165-167	51-52
VII.—Agricultural and Fiscal Statistics—		
The Calcutta Conference Forms settled and introduced into the Bombay Presidency	168	52
Information required for the Statistical Forms not received from District Officers, and therefore the tables not given	168	52
Steps taken to compile Rainfall Returns in such a form as to show the effect of rain on different crops at different times and the rainy and rainless days of each fortnight	169-180	52-53
VIII.—Trade and Trade Statistics—		
Review of the Rail-borne and Road Traffic Report for 1884-85 ...	181-185	54-55
Rainfall Returns		58-68
Appendices—		
A.—Examination papers of the Dharwár Staff in Survey and Measurement work		71
B.—Revised Rules for recruitment of Circle Inspectors		72
C.—Exports of Indian Wheat from the port of Bombay		73
D.—Proverbs on cultivation		73

No. 1645 OF 1885.

From

E. C. OZANNE, ESQ.,
Director of Agriculture,
Bombay.

To

J. NUGENT, ESQ.,
Secretary to Government,
Revenue Department.

Poona, 23*rd October* 1885.

SIR,

I have the honor to submit the Second Annual Report of the Agricultural Department. The first Report circulated with Government Resolution No. 9508 dated 2nd December 1884, reviewed the working of the new department from its commencement till the middle of October 1884.

INTRODUCTORY.

Itinerary.

2. My movements during the year have been as follows:—

NOVEMBER.—Visited Ahmadnagar Cattle Show. Went to Sind to see the Haidarabad Farm.

DECEMBER.—Visited Bhadgaon Farm. The Poona Cattle Show detained me for the rest of the month at head-quarters.

JANUARY.—Spent the whole month with part of February travelling in parts of the Gadag, Hubli, Dhárwár, Bankápur and Karajgi tálukás of Dhárwár—supervising the work of the Circle Inspector establishment.

FEBRUARY.—Returned from Dhárwár on the 9th. Visited Bijápur on the 21st to make preliminary arrangements for the introduction of the Circle Inspector staff.

MARCH.—Visited the Nadiád Show in Gujarát. Halted at Surat to see the High School Farm. Visited Khadkála, Lonávla, Karjat and Igatpuri to supervise *ráb* experiments and make preliminary arrangements. On 11th March met the steam wheat-thresher introduced for experiment by the authority of Government Resolution No. 10057 dated 22nd December 1884, and spent 3 days at Niphád, in the Násik District, conducting the trials. Again met the machine at Puntámba, in the Ahmadnagar District, on the 18th March, having in the interval visited the experimental *ráb* plots at Igatpuri and Lonávla. From this time I made my head-quarters at Lonávla to be close to these plots.

APRIL.—On the 17th opened a silo at Poona; on the 25th paid a second visit to the Bhadgaon Farm, halting on the way at Igatpuri. On the return journey joined the camp of the First Assistant Collector at Borivli, in Thána, to see with him the site of a proposed reclamation of salt marsh since sanctioned (Government Resolution No. 7063 dated 31st August 1885).

MAY.—Spent 3 weeks in Dhárwár—supervising the instruction of the Circle Inspectors in measuring and other survey work. Visited Bijápur on the return journey.

JUNE.—Visited *ráb* plots at Lonávla and Karjat on 23rd, and at Lonávla again on the 29th. Thence I proceeded to Igatpuri on the 30th to see *ráb* plots, and to be present with the Survey Superintendent at the introduction of the revised rates into the táluka.

JULY.—I was present at the transplantation of the experimental rice plots at Karjat and Lonávla on the 10th. On the 11th I met the Committee of the Chamber of Commerce in Bombay. On the 22nd I saw the rice transplanted at Igatpuri. On the 28th I was again at Bijápur, when the final selection of Circle Inspectors was made.

AUGUST.—Incapacitated from travelling.

SEPTEMBER.—At head-quarters.

OCTOBER.—Visited Dhárwár to inspect the District Inspector's office and to arrange for the transfer of the Bijápur Records from Dhárwár.

3. My head-quarter office was moved from Bombay to Poona on the 15th March. The office is located in a hired house till such time as the Commissioners' office buildings sanctioned in Government Resolution No. 67 C. W.—132 dated 20th January 1885, are completed. Provision has been made for my location in these offices, which will be very convenient and will save much correspondence. An addition to my office establishment of a trained survey measurer and classer on Rs. 40 has been sanctioned from April. This man is designed to instruct the non-survey element of the Circle Inspectors as each district is opened. When not so engaged, his time is employed as a technical assistant in my office for the disposal of correspondence connected with survey work.

Establishment.

Government Resolution No. 3306 dated 23rd April 1885.

My head-quarter and travelling establishments have been amalgamated. Advantage has been taken of transfers and retirements to redistribute the clerks to suit the requirements of the work. I have now 14 clerks costing Rs. 662 per mensem as against 10 clerks whose pay aggregated Rs. 670 last year. These are exclusive of the Survey Instructor, and, of course, of my Assistant, Ráv Bahádur Bhimbhái Kirpárám.

I.—ORGANIZATION AND MAINTENANCE OF VILLAGE RECORDS.

4. The Circle Inspector establishment, which was organized in Dhárwár last year, has been extended to the Bijápur District.

Advantage was taken of the reduction of a survey party, attached to the Southern Marátha Country Survey, to depute 15 measurers to Bijápur in February to form the nucleus of the establishment, but primarily to carry out village to village enquiry in three scarcity-affected tálukás. These men were employed till the commencement of the monsoon in village enquiry. They were then placed under the orders of the District Inspector of Bijápur (who, as in Dhárwár, was the Huzúr Surveyor) to prepare compensation statements for land taken up several years ago for four large roads, to measure up land subsequently required for murum pits, and for the stacking of metal, and to clear off the arrears of petty measurement work which had accumulated in the hands of the Huzúr Surveyor, though the latter had for some time been helped by an Assistant.

Government Resolution No. 955 dated 31st January 1885.

5. The staff required for Bijápur was found to be 40 men. From the 1st July five more subordinates of the Survey Department, including two classers, were secured. The Assistant Huzúr Surveyor was added. The remaining 19 were selected as follows:—

1.	From the revenue subordinates of the Bijápur District ...	14
2.	Do. do. Dhárwár District ...	2
3.	From the passed students of the Agricultural Branch of the College of Science	2
4.	From the passed students of the High Schools (agricultural classes)	1
		19

I have not, as in Dhárwár, permitted recruits from the Educational and other departments to join the staff—for reasons which the standing orders for recruitment printed as an appendix to this Report will explain. I have, however, not secured so many English-speaking men in Bijápur as in Dhárwár. The Bijápur District has no high school, and there are much fewer matriculated men in the revenue ranks. Moreover, there is a greater prospect in the regular line for non-graduates in Bijápur than in more advanced districts, and the best revenue subordinates were not tempted by the pay and prospects of the new branch.

6. To the post of Assistant District Inspector, I have appointed Mr. P. B. Limaye, the first of the successful students of the first year of the Agricultural Branch of the College of Science, who since leaving College has gained a good deal of practical experience in farming while in charge of the small farm

attached to the Ahmadnagar High School, where Mr. Limaye served as Agricultural Instructor for 3½ years with much zeal and credit.

7. The selected Circle Inspectors, who were not trained in the Survey Department, were placed under the Survey Instructor at the beginning of August. After one month of general instruction, they were directed to undertake the measurement of an unsurveyed alienated or *inám* village under the close and continuous supervision of the Instructor, assisted by two trained measurers. The Collector concurred with me in thinking that this would be of more practical utility than desultory instruction measurements.

8. The staff will be distributed throughout the District on the 1st November after having undergone an examination in the elementary principles of measurement and in the rules for the repair and erection of boundary marks. Those who fail to show that they have profited sufficiently by the instruction received will next year be required to undergo further instruction at their own cost, or may be required to revert to their former appointments.

9. I would not have it supposed that I consider a three-months' course sufficient to transform these men into trained measurers, but they will learn enough to be of very great use in their work, and to enable them by practice to perform all but intricate measurements, for which the large proportion of Inspectors trained in the Survey Department can be made responsible.

10. The selected Inspectors from the Survey Department are meanwhile commencing a thorough examination of the boundary marks of each village, at the same time bringing the village map up to date. I may here explain that this complete boundary-mark inspection has been accepted by Government as one of the most important initial duties of the new staff. The Survey Department after a re-measurement of the fields, which re-measurement is year by year becoming more partial in its extent, resigns the control of boundary marks, bequeathing the survey record which consists of—

1. The field marks.
2. The village and other maps.
3. The records prepared concurrently with the erection of marks and preparation of the maps.

Every year alterations in the field marks by negligence, by sub-division of numbers, by alluvion and diluvion, by new roads, railways and other public works, go on. Marks which were cancelled as redundant at the Revision Survey, and which should have been removed, have in numerous cases been allowed to remain. Some, indeed, have been erroneously repaired. A permanent establishment to prevent the destruction of the field marks is so necessary that without it an indefinite existence of the Survey Department with periodical revisions of measurements would be entailed. This maintenance of boundary marks cannot be entrusted to untrained men. No subject called for the remodelling of the old staff of general-duty Kárkúns of the Mámlatdár's establishment more than this. General-duty Kárkúns, however zealous and however free from other duties, had not the special knowledge requisite to keep the marks in proper order, but in fact they were so overwhelmed with miscellaneous work that it is not too much to say that the field marks have been left to look after themselves since the day that the survey parties left the districts.

The Land Revenue Code Rules provide for an annual inspection. The Village Forms require the same, but practically both have been dead letters. The first step, therefore, is to make a thorough inspection of all the marks of each village in its turn by men competent to do the work. In order that the work may be thoroughly done, the rules under the Code for the annual inspection are held in abeyance till the complete inspection, which may take 4 or 5 years, is accomplished.

Government Resolution No. 3515 dated 1st May 1885.

There will, however, be still the annual inspection by the village officers and a careful test inspection by the Circle Inspectors of each village, in order that the marks may not again fall into their present condition of gross disrepair.

11. In sanctioning the staff for Bijápur an important departure was made as regards the contemporaneous reduction in the General-duty or Bhág Kárkúns. In Dhárwár one of such Kárkúns was reduced in each táluka. In Bijápur the reduction was practically *nil*, and thus with the introduction of the new staff the Mámlatdárs have received an important and very necessary strengthening of their regular establishments.

12. Another important principle has been established, *viz.*, that the Circle Inspectors shall have nothing to do with the revenue fiscal work of the District, save in exceptional cases, and then only with the express sanction of the Director of Agriculture. Their whole strength will be expended on the statistical registers, inspection work, and miscellaneous survey work.

13. To turn now to the Dhárwár staff, which has completed one year's existence. I made a short tour in January and February, during which the work of nearly half the Inspectors came under my notice to a greater or less extent. My duty will normally be that of bringing to the notice of the Collectors, personally and through my subordinates, the shortcomings of the Inspectors. But I judged it in this case to be rather that of aid and advice, rather of ascertaining the difficulties which the Inspectors meet in their work, than of seeking to show where they had not reached a proper standard of efficiency. I sought, therefore, to ascertain points which called for decision in modification of, or in addition to, the principles originally laid down. At each stage of my tour these difficulties presented themselves, and were referred to the Collector, and where necessary to the Commissioner, with the desired result that most were satisfactorily removed.

Government Resolution No. 5036 dated 23rd June 1884, para. 3, and
Government Resolution No. 3306 dated 23rd April 1885, para. 12.

14. I found that the Mámlatdárs had already begun to look on the new establishment rather as aliens than as an establishment for whose duties they themselves are responsible, and in which they themselves are most interested. I found a tendency on the part of the Mámlatdárs to utilize the services of the Circle Inspectors precisely in the manner in which Bhág Kárkúns were utilized. One or two instances may be quoted to bear out these assertions. In cases the Mámlatdárs had entrusted the sale of waste lands applied for for occupation to the Inspectors. In cases the Inspectors were ordered to give publicity to the objects and principles of local self-government, and even to prepare lists of eligible voters. Some were directed to examine the revenue and police files of village officers, some to prepare subscription lists towards the repair of village tanks,—I need not go on,—but will say that frequently these duties, which are in no degree part of the authorized work of the Inspectors, were exacted at the very time when the Inspectors should have been engaged in crop inspection, boundary-mark inspection and other of their set duties. The Collector invariably put his veto on the action of the Mámlatdárs, and in justice to them it must be remembered that the reduction of their General-duty Kárkúns had necessarily left them short-handed. Work had to be done, and the Inspectors were generally the most convenient agents.

15. A very important duty of the Circle Inspectors is to improve the cultivation returns, and to this I paid most attention, especially as it was the work on which the Inspectors were engaged during my tour. On ten different days I spent 3 or 4 hours in the field with different Inspectors, checking the inspection returns of the village officers, and instructing the Inspectors how the work should be done. On the whole, I was surprised at the accuracy with which the registration by the village officers is done. I attribute this principally to the fact that they knew well enough that this year their work would be checked. On the other hand, I noticed an almost universal omission of unsown portions of fields. The extensive areas completely unproductive of any crop, owing to the spread of *hariáli*, *kunda* and other weeds, are thus reported to be cropped with the crop which may surround them. Again, the prevalance of crop mixtures and the absence of system in regard to the ingredients were remarkable, no less than the almost total absence of the recognition in the registers of the minor ingredients of row crops and crop mixtures. The omission of the second crops on

twice-cropped areas did not come particularly under notice. But I know this omission to be very general.

Mr. Fairlie Muir in a crop-experiment report from this district has brought this omission into prominence. I quote:—"There are 112 Government and 19 *inám* villages in the táluka. In 105 of the former there are, exclusive of the *inám* land in these villages, 22,787 acres of occupied rice land, while the amount of twice-cropped rice land is entered (in the village registers) as only 303 acres, and that in only 7 villages. This is manifestly incorrect. A considerable portion of the rice land is undoubtedly twice cropped. Twice-cropped rice land is also met with in almost every rice village. Further, the great majority of the Kulkarnis, whom I have questioned, admit that they do not enter the second crop. They plead ignorance." The deduction I wish to draw from these facts is that the work of the Circle Inspectors in improving the crop statistics is very important work. No check was ever exercised by Bhág Kárkúns, and the village figures, incorrect and unscrutinized, have perforce been accepted for all important deductions which are drawn therefrom for administrative and other purposes. The Inspectors are untrained in this respect, and accordingly I have with great care drawn up detailed rules for their guidance. These are not rules to which they can exact adherence from the village officers; but if in their supervision work they carry out the directions laid down, they will themselves become experts in the eye-estimation of crop areas, and the attention they pay to the work will be the measure of the attention which the village officers will pay. Moreover, from the careful estimates made in about 10 per cent. of the cultivated area by the Inspectors, fair deductions may be drawn regarding the balance.

16. Statistics of population and agricultural stock have received due attention. Two months of the year are devoted to this work. The demands of the administration reports of Assistant Collectors necessitate the yearly census in June and a return on the 1st July. No check has ever been attempted, nor, indeed, with the ante-Circle Inspector establishment, was any possible. I have fixed the time allotted to this work, so that the check may commence on the 1st July, and the revised figures compiled in the Mámlatdár's office early in September, so that in my annual report the results of the check may be incorporated.

17. I need not refer in detail to the other duties of the Circle Inspectors, but may enumerate them, including those referred to above—

A.—Supervision of Village Records.

(1) Boundary-mark inspection. (February, March, April.)

(2) Crop inspection to check the registration by village officers, and to ascertain the condition of each crop for the purpose of estimating produce and preparation of forecasts. (November, December, January.)

(3) Checking the figures of the annual census of population and stock. (July, August.)

(4) Checking the entries in the death and birth registers, the cholera, small-pox, vaccination, and other registers and returns required by the Sanitary Department.

(5) Checking the village registers of wells and other sources of water-supply.

(6) Inspection of Government waste land to check encroachments and unauthorised cultivation.

B.—Survey Work.

(7) Measuring land required for building sites.

(8) Measuring land táken up for roads, tanks and other public purposes and preparing the returns necessary for the due alteration of the records.

(9) Disposing of partitions of land under decree of Civil Court or on the duly sanctioned petition to the Revenue authorities.

(10) Measuring alterations caused by alluvion and diluvion, and preparing the necessary statements for correction of the records.

(11) Making such other miscellaneous measurements as may be required by the Revenue authorities in disposing of disputes and the like.

C.—Agricultural Enquiry.

(12) Noting carefully the cultivation of the staple crops, the varieties of crops and crop mixtures, the times of sowing and harvesting, the amount of seed sown, the implements of husbandry, manures, crop diseases, and the like.

(13) Watching prices, trade, wages.

(14) Supplying the Director of Agriculture with such information as may from time to time be required.

Eight months in the year are thus allotted to set duties. The rest will receive attention when most convenient or when necessity requires. In the intervals the complete boundary-mark inspection (para. 10) will be taken up.

18. In order that full advantage may be obtained of the knowledge and experience gained, the compilation of the táluka forms from the village returns will be made by each Inspector for his circle under the supervision of the Mámlatdár. The point gained is that the agency which checks the registers in the villages is also the compiling agency. In the work of improving statistics this point is important. The principle is extensible. The Huzúr Forms or the summaries for the Collectorate of the táluka returns—as far as they deal with the subjects entrusted to the Circle Inspectors—may be compiled by the District Inspector under the supervision of the Collector. The Provincial Returns are compiled in my office. This arrangement does not in any way diminish or interfere with the full authority and responsibility of the Revenue Department, but it at the same time secures a connection with statistics to my department from the first registration in the villages till the final compilation for the Secretary of State. I conceive that this is a guarantee for the correctness of statistics which will, as the agency becomes more expert at its work, secure reliance on the figures which it would be very rash now to claim.

19. At the beginning of the new organisation connected more or less intimately with the Agricultural Department it is fortunate that so much attention is being paid in high quarters to the improvement of statistics.

Government Resolution No. 4323 dated 29th May 1884.

Last year (Report, para. 8) I noticed the work of the Statistical Conference in Calcutta, and of the Committee on Huzúr Form 17 H. (crop statistics). Later on (Report, para. 9) a Provincial Committee composed of the Divisional Commissioners, the Survey and Settlement Commissioner, the Chief Engineer for Irrigation, the Collector of Poona and the Director of Agriculture considered the forms prepared by the Calcutta Conference.

Government Resolution No. 1887 dated 5th March 1885.

20. The modifications of these forms required to make them suitable to the Bombay Presidency were accepted by the Government of India. But the deliberations of the Committee further resulted in a strong recommendation to Government that the Manual of Revenue and Statistical Accounts and Registers—known as Hope's Forms—should be thoroughly revised and recast.

"We have in our minute study of the Forms prescribed in Hope's Manual come to the conclusion that these demand a complete revision. From time to time considerable alterations and additions have been made in the Village and Táluka Forms, and of late the decisions of the Committee on Huzúr Form No. 17 H. and now the requirements of the Secretary of State have necessitated alterations which, superadded to those previously ordered, call for thorough recasting of the Manual."

Government Resolution No. 9706 dated 9th December 1884.

Mr. W. P. Symonds, C. S., was placed on Special Duty, but he soon afterwards went on privilege leave, and on his return could not be again spared for special duty till the 14th August. The interval was not lost time. Opinions of District officers and of the heads of various departments were collected, and Mr. Symonds devoted much time to study. Since July last he has been assisted by a Committee composed of the Assistants to the Commissioners of Divisions with my Assistant as Secretary.

Inasmuch as I am most interested in the statistical portion of the work and as I was a member of the Calcutta Conference and also of the Committee which asked for the revision of the Manual, and as by the aid of the Circle Inspectors in Dhárwár I have been able to learn much of the practical deficiencies of the forms, I have associated myself with Mr. Symonds by preparing the

revised statistical forms in constant consultation with him, and have submitted them for the consideration of his Committee and for his editing. The revision is being made with great care, and will not only be productive of improved statistics, but will save much labour in the villages and the tálukás. The principle has been fully adopted, that nothing is demanded which is not within the known capabilities of the agency which is available. The revision of the Manual will be the completion of the work initiated by the Calcutta Conference and by the Bombay Government in appointing the Committee to remodel Huzúr Form No. 17 H.

21. To return now to the Dhárwár establishment. Experience has shown that the head-quarter District staff of the Agricultural Department was insufficient. To the staff described in clause 4, para. 7, of last year's report have been added—

Government Resolution No. 6403 dated 7th August 1885.

1. An assistant on Rs. 40—50, trained in the Survey Department, to be in charge of the head-quarter office, and responsible for the due custody and correction of all survey records.

2. A *daftarband*, Rs. 10.

Government Resolution No. 3306 dated 23rd April 1885.

A similar sanction has been accorded to Bijápur. The scale of pay of Assistant District Inspectors has been modified, travelling allowances according to the Code rules having been granted, "entirely apart from the fixed salary, as an additional inducement to them to move frequently about the District."

Government Resolution No. 4950 dated 17th June 1885.

22. In connection with the transfer of the survey records of Bijápur the question arose, owing to the want of accommodation, whether it would not be better to form at Dhárwár, in imitation of the practice of the Survey Department, a strong head-quarter establishment for the custody and correction of the records for the four Kánarese Districts, instead of separating the records of each District and locating them at the head-quarter station of that District with a necessarily weaker head-quarter establishment. The proposal was negatived after reference to the Survey Commissioner, and a sanction of Rs. 2,000 accorded for providing accommodation at Bijápur. With the decision I am well satisfied, especially as it followed the ruling that "considering the serious responsibility attaching to any correction of the survey record, it must be insisted on that no such corrections should be made unless under the fullest guarantee that they are made by competent persons under competent supervision."

Government Resolution No. 3306 dated 23rd April 1885.

The sanctioned staff is adequate, but as regards supervision the time has arrived when I have begun to look for further aid from the Survey Department. With 80 Inspectors at work scattered over two large districts, with the valuable records partly at Dhárwár and partly at Bijápur, in charge of men, who, though competent, have been accustomed to the closest supervision, with the daily increasing alterations and corrections the final sanction to which in each case is given under my own signature, with the certainty of an early extension of the new staff to new districts, the supervision which I can exercise is gradually diminishing. The Agricultural Department is designed to take over the districts finally classed by the Survey and Settlement Department, which is itself being brought to a close. I conceive that no supervising agency more fitted for the work than the Assistant Superintendents of Survey could be found, and these are the officers for whom provision will have soon to be made. Their training and experience are so valuable for the proper administration of the remodelled statistical staff being organized under the auspices of the Agricultural Department that I should fail in my duty were I not to press my claims for the gradual transfer of as many of these officers as necessity may require. It will not meet the necessities of the case if no transfer is made till the Survey Department is finally wound up. The plan which recommends itself to me is that the transfer should be gradual, that a commencement be made now by the transfer to the Agricultural Department of one Assistant Superintendent to be in charge of the two Districts already taken over. It would be the special duty of this officer (1) to supervise the work of the Circle Inspectors personally

and through the District Inspector and his Assistant, (2) to be responsible for the due correction and alteration of the survey record, (3) to inspect the district head-quarter offices, (4) to sign the *Ákárbands*,[1] (5) and generally to take over as my Assistant, as far as concerns his charge, the work which I have begun, and which now devolves entirely on me. That such a plan will to a certain extent delay the consummation of the Survey Department's work is clear unless the establishments can be kept at full strength by recruits from the Mysore and Sind Surveys; but, on the other hand, it will secure a just succession to the Revenue Survey. It will add to the cost of the scheme for the organisation and maintenance of the village records, but the additional cost is not incommensurate with the importance of the work. A representation to Government asking sanction to this plan is now being made.

The plan is quite consistent with the ruling of Government Resolution No. 5036 dated 23rd June 1884—"It will be impossible for the Director of Agriculture to carry on his extensive duties of agricultural experiment and observation or to lay the foundation of a permanent department competent to deal with questions of settlement, as contemplated in the Resolution of the Government of India, No. 340 G. of December 8th, 1881, unless he is permitted to form a local staff by degrees in the course of the years which remain before the completion of the field operations of the Revenue Survey."

23. The Instructor attached to my office (para. 3 above) was employed in May and part of June in instructing 19 Circle Inspectors of Dhárwár in elementary surveying and the rules for boundary marks. Almost all these men had before their appointment been attached for instruction for periods less than 3 months to a Survey Party, but experience had shown that their knowledge was very insufficient. I personally supervised the instruction and set the examination papers, translations of which are given in the Appendix. Eleven of the examinees succeeded in scoring half marks and over. Of these four passed a very creditable examination. Of the rest, seven reached a standard which satisfies me that they may be entrusted with the ordinary duties they have to perform, but one showed so little knowledge that he has been directed to join the class at Bijápur without pay. Besides these, two candidates were permitted to attend the Dhárwár class. Both failed and are now studying at Bijápur.

24. Connected with this subject the question arose for decision whether Circle Inspectors should be required to pass the Subordinate Revenue Departmental Examination. This examination is compulsory on men who join the Revenue Department as a condition to their confirmation. The examination demands a study of revenue subjects other than the special ones entrusted to the Circle Inspectors and, moreover, of Magisterial and Police Acts and Regulations, with which the Circle Inspectors are not concerned.

It is true that owing to the impossibility of securing at the outset men trained in all the three branches of the work devolving on the Inspectors, revenue, survey and agriculture, a considerable number of the posts are unavoidably filled by revenue subordinates, whose connection with the special branch will be only temporary. On these the Departmental Examination will be compulsory. But it will very seldom, if ever, happen that revenue subordinates, who have not already passed the examination, will be appointed Circle Inspectors.

Government Resolution No. 6958 dated 30th August 1884.

As to the rest, Government have acceded to my proposal that a special test should be demanded. The views of the Committee appointed to consider, *inter alia*, the question of the recruitment of the Circle Inspectors, laid down the principle that "the object of the Circle Inspectors and the corresponding higher grades of the Agricultural Department is to create a specialist branch, and in that branch, whether it be considered part of the Revenue Department for administrative purposes for a time and later on a part of the Agricultural Department, the men once appointed should remain till the end of their service." The duties of the Inspectors are connected with revenue, survey and agriculture. Each Inspector will in time combine the three characters, but that cannot be expected at once, and I am compelled to supply the

[1] The *A'kárband* is the final record of the Survey and Settlement Department showing the area, soil classification, and assessment of each field.

elements from distinct classes of men who possess one or more of the necessary qualifications, and to seek to superadd the others by training and experience. The survey element comes from the ranks of the diminishing survey establishments, which is so important that one-half of the Inspectors are to be drawn from this source as long as the supply lasts. The revenue element is secured by the offer of a rate of pay which will tempt the most intelligent and promising of the juniors of the regular revenue staff to volunteer. These at the same time are the most teachable. In order to make the beginnings of an introduction of the agricultural element I have looked to the College of Science and to the Agricultural classes of the High Schools.

The scheme printed in the Appendix will with this explanation be easily understood, and the remarks just made show that the departmental test required from revenue subordinates has only a very limited application. Government has, therefore, directed me "to submit proposals for the institution of a special departmental test applicable to officers of the Agricultural Department, when the scheme for the recruitment of the department now under consideration is settled." The examination of non-measurer Circle Inspectors made in Dhárwár in June and that to be made in November in Bijápur will form an essential feature in the scheme.

Government Resolution No. 3305 dated 23rd April 1885.

25. A few remarks as to the manner in which I propose to introduce the agricultural element must here be made. The only instruction available in agriculture is imparted at the classes attached to some of the High Schools and to the special branch of the College of Science. The Committee referred to in para. 24 above, proved clearly that by reason of the special privileges assured to graduates no feasible plan for opening out inducements to the students of agriculture at the College of Science can be devised, unless the University can be moved to establish a degree of agriculture. This proposal met with approval, and Government called for a scheme from the Director of Public Instruction and the Principal of the College of Science, but later on warned me that as regards the introduction of the agricultural element into the Circle Inspector ranks the solution of the question of a University degree in agriculture, which is certain to proceed very slowly and the decision on which cannot be foreseen, should not be waited for.

Government Resolution No. 1024 dated 3rd February 1885.

Government Resolution No. 3308 dated 23rd April 1885.

The matter has, however, made some progress. Dr. Cooke brought it before the Syndicate of the University. A Committee of Fellows has been nominated to consider and report their opinion. Of this Committee I am a member.

26. Irrespective of this question I have asked for sanction to select, year by year, from the ranks of the Circle Inspectors, men to proceed to the College of Science, to go through the agricultural course as Government nominees. This proposal has so far found support that Government have called for a detailed scheme.

Government Resolution No. 2192 dated 14th March 1885.

Lastly, the recruitment scheme shows that Government has given some encouragement to the Agricultural High School classes by the special provision of para. 7 of the Rules.

27. With the experience gained I have drawn up rules for the guidance of the Circle Inspectors. These have been discussed by the Collectors of Dhárwár and Bijápur, and I have been favoured with much assistance by the Survey Commissioner. At the suggestion of the Commissioner S. D., the Rules were considered in detail by a Sub-Committee of Assistant Commissioners with the intention of afterwards placing them before the Commissioners (including the Survey Commissioner). However, in order that the results of the revision of the Manual of Revenue Accounts might be fully before me, before issuing final Rules, it has been considered advisable to distribute the Rules provisionally with the approval and sanction of the Commissioner S. D. They will be put into permanent shape next year, and will be all the more complete by reason of the delay.

28. I have little power of showing by means of figures and statements the practical results of the work of the year in Dhárwár. The Inspectors are subordinates of the Mámlatdár and their work will be more properly reviewed by the Collector and his Assistants. I may, however, mention that all partition decrees of the Civil Courts were disposed of punctually, except in one case, and that though half the Inspectors were little trained in measurement work, the number of cases for disposal was reduced from 192 to 152, though no less than 175 new cases—an unusually large number—arose during the year. The arrears will now rapidly be cleared off.

II.—ANALYSIS OF DISTRICTS WITH REFERENCE TO SECURITY FROM FAMINE.

29. The Bombay Famine Relief Code has now been published. The connection which this Department had in its preparation was described in para. 4 of my Report for 1883-84. In Section 17 of the Code the Divisional Commissioners are enjoined in consultation with me to draw up as soon as possible "a statistical account with map for each district, showing the areas which are liable to famine, the causes which make them so liable, their accessibility or otherwise for relief purposes, the economic condition of the population of such areas, and a rough forecast of the maximum number of persons within each likely to require employment on relief works in a year of famine."

It has been decided that the Collectors shall supply information on the set points for compilation in my office, and submission for approval to the Commissioners.

Government Resolution No. 5542 dated 26th July 1883, para. 6.

Vide Appendix A to Report of 1883-84 and Government Resolution No. 9508 dated 2nd December 1884, para. 8.

30 This special statistical account will in no way interfere with the "Agricultural District History and Manual" which has been commenced under the orders of Government. This latter will have a larger scope. It will be prepared gradually as each district is furnished with the special statistical staff, which forms the subject of paras. 4 to 18 of this Report; whereas the former, called for by the Famine Code, will be worked up as soon as possible and contemporaneously for all districts. It will form a suitable section in the more complete Analytical Summary.

Fair progress in the analytical work has been made. The draft for the Dhárwár District is in print. All the information that can be collected from the existing sources has been collated and put into form. What remains to be done is to check the details recorded by the help of the Circle Inspector staff, to collect additional information where the available sources are found wanting, to improve the descriptions of the cultivation of the staple crops, to prepare the necessary maps, and generally to make the analysis a trustworthy guide such as will not only be a faithful record of present conditions, but will also direct and control the administration of famine. As far as Dhárwár is concerned, the analysis can be completed without difficulty; but when other districts are commenced it will be a severe tax on my establishment to prepare a similar careful and exhaustive record. Still this must be done, though the progress may be slow. As far as possible, unprotected districts will be taken up first.

The Madras Government in making provision for a similar analysis has deputed a specially trained officer, Mr. C. Benson, M. R. A. C., to the work. Mr. Benson is now occupied in enquiry in the Kurnul District in which he anticipates that the field work will occupy 6 months. I mention this fact, as it coincides with my view of the necessity of doing the work cautiously and without haste, and also to adduce a strong additional support to my claim for the aid of an Assistant Superintendent of Survey (para. 22 above). This officer would in his tours pay special attention to the facts required for the analysis. I regret that I cannot personally arrange to travel so as to give this finishing touch to the work. But for the next travelling season at any rate my movements will be subordinated to the work of the Forest Commission.

III.—SYSTEM OF COLLECTION OF REVENUE AND RENTAL IN PRECARIOUS TRACTS.

31. With this subject the Agricultural Department has not yet been brought into connection.

IV.—MEASURES OF PROTECTION, INCLUDING—

(1). Fodder Reserves and Arboriculture.

(2). Extension of Communications.

(3). Irrigation.

32. I will confine myself, under these heads, to whatever has special concern with the Agricultural Department, and shall not attempt to encroach on the ground covered by the Forest, Public Works, and Irrigation Departmental Reports.

(1). Arboriculture.

Government Resolution No. 7001 dated 2nd September 1884.

33. Last year I noticed an anticipated encouragement to the extension of *bábhul* plantations through the appreciation at home of the merits of *bábhul* pods for tanning purposes. No real encouragement has been afforded. A consignment of pod shells was sent to the Secretary of State, but no reply has been received as regards the market value of the material. Eight bags of *bábhul* pods were exhibited at the Forestry Exhibition at Edinburgh by the Conservator of Forests, N.C., together with other tanning materials. Though the first place was accorded to the collection by the jurors, no special mention was made of the *bábhul* pods.

Government Resolution No. 6282 dated 5th August 1884.

Further, though Government has intimated readiness to grant any reasonable concessions to applicants desirous of forming *bábhul* plantations and though the District officers were requested to use every endeavour to induce landholders to utilize suitable land for the formation of village *bábhul* reserves, I have no progress to report. I look on this fact with much regret, but I am helpless. I can only hope that the matter will this year be taken up.

34. Last year I noticed under the head of arboriculture the *ráb* experiments which were being arranged. This subject has occupied a great deal of my time and study, but the appointment of the Forest Commission has given it still greater prominence, and the experiments have proved more opportune than could have been anticipated. The experiments have been carried out in five distinct localities, and, generally speaking, as far as they have gone, corroborate the facts elicited by enquiry. The harvest has not yet been reaped.

(3). Irrigation.

Government Resolution No. 150 C.W.—315 dated 4th March 1884.

35. In reply to a reference from the Government of India respecting the desirability of encouraging the extension of well-irrigation by reducing the cost of wells and lifts and building wells in places where there now are none, the opinions of the officers of the Public Works Department were solicited and compiled. Incidentally the assistance which may be anticipated from the use of boring apparatus was suggested for experiment. On the receipt of the papers the Government of India brought to notice the work done in the North-West Provinces by Mr. Wilson and Captain Clibborn. A suggestion then emanated from this department that

(1) The question of experimenting with Mr. Wilson's boring apparatus should be considered, and

(2) the example of the North-West Provinces should be followed by the deputation of a competent officer to enquire and report on the following points:—

(*a*) Whether assistance in the methods of sinking and building wells can be afforded by the application of engineering science.

(*b*) The feasibility of improving the native water-lifts.

(*c*) The utility of recording depths of water levels.

Government Resolution No. 730 C. W. No. 1624 dated 6th November 1884.

Mr. F. D. Campbell was accordingly placed for three months on special duty.

36. The results of his investigations may be summarized as follows :—

(1). *No machinery in the shape of boring tools or dredgers will be of any use, as a rule, to the rayat in enabling him to sink a well at less cost than by the ordinary method.*

REASONS :—In Gujarát the superficial strata, consisting of a sandy loam, of recent alluvial deposit, of great depth, (100 feet at least), present a nearly flat surface. The water level is regular. Trial shafts are seldom found necessary, but when they are sunk the cost is not more than Rs. 10 on the average.

In the Deccan and Southern Marátha Country the depth of soil is very small. Probably in 95 per cent. of the area it does not exceed 10 or 15 feet, and generally is far less. Below the soil lies the murum, which gradually merges into the hard, dense and non-porous basalt. Water is found in the murum, and it seldom pays to pierce the basalt. Its level is ever varying. Clearly, then, the boring apparatus found useful in the North-West Provinces has little chance in either the Gujarát or the Deccan districts. In the former it is not wanted. In the latter it would not be found suitable.

(2) *As regards the construction of wells, the rayats are conversant with, and do make use of, when necessary, a very cheap system of well-making which it is impossible to improve upon.*

For the detailed reasons which support this deduction I must refer to Mr. Campbell's report. It is only necessary to note that it is found that the rayats in the Deccan occasionally construct rectangular wells with straight walls, which must be more costly and unstable than wells of a circular pattern. As to this, Mr. Campbell says: "I believe the rayat is generally aware of this (superiority of the circular pattern), but still many mistakes are made, with the result that the straight sides fall in after a few years. I, therefore, think that whenever opportunities occur for giving advice, they should always be told to adopt the circular pattern." In connection with this subject I would adduce the testimony of the Rev. J. Shilledy, residing at A'nand in the Kaira District. He says: "Government can do little in the way of helping the people to cheapen wells," and "People do not dig wells wider than they actually require."

(3) *The native water-lift or Mot is more efficient than any other water-lift which has yet been tried in the country, and which at the same time as regards cost and suitability for adoption can compete with the Mot.*

The best way of illustrating this opinion is to quote the conditions laid down by Mr. Campbell for enunciation to any innovator who wishes to introduce an improved lift. These are :—

(1) That the machine is not on a large scale.

(2) That it is suitable for irrigating about one acre per diem.

(3) That it can work at various depths up to 60 feet.

(4) That it is capable of raising at least 115,000 cubic feet of water one foot per rupee of cost, including all charges on capital, depreciation, and repair.

A machine that cannot fulfil these conditions cannot compete with the Mot.

The same gentleman whose opinion has just been quoted regarding the impossibility of teaching the native how to build his wells more cheaply, thinks, on the other hand, that it would be of the greatest benefit to the rayat if Government would introduce some cheap and more effectual method of lifting water than that in use. No doubt it would, but is it possible?

My letter No. 555 dated 20th May 1885.

37. The deduction which I draw from the enquiry and report is as follows :—

"It appears quite clear that Mr. Campbell, a competent and experienced Engineer, on a full review of the evidence collected, is convinced that we cannot assist the rayat either by teaching him how to build cheaper wells, or by introducing improved water-lifts. If Government is satisfied that this deduction is established, it follows that the Agricultural Department should refrain from experimenting with any water-lift, unless such lift can enter into competition with the Mot on the conditions set forth in Mr. Campbell's 53rd paragraph."

38. Mr. Campbell has discussed the merits of various water-lifts which have been tried, and it will be well to record shortly his decision as regards each one.

(1). THE DOUBLE MOT.—Sometimes called the Madras Double Mot and in this Presidency Mr. Strip's Double Mot.

It is a modified form of working the leathern bags of the ordinary Mot. It consists simply of an arrangement for raising two bags alternately by means of a vertical revolving drum round which the ropes attached to the bags are wound. The bullocks work the drum by means of a long bar or lever fastened to it, and walk in a circular path till one of the bags is emptied of its contents. They are then made to reverse, and walk in the opposite direction till the other bag has been brought up and emptied.

Mr. Campbell admits that if the length of the lever is twice the diameter of the drum, all other conditions being similar, one bullock might draw up the same bag that two are usually able to do by the direct action. But it would take at least twice the time to do it, owing to the length of the path being doubled. In practice, however, an animal cannot on a small circular path exert the same force and to such good effect as it can do on the straight inclined one of the ordinary single Mot, which generally has a slope of about 1 in 5, and, again, although the animal is more continuously in work in the double machine, it works more vigorously in the ordinary one during the short period it is drawing, on the principle that animal power will always produce the highest mechanical effect when worked as it were intermittently,—that is, violently for a short period and *assisted by gravity*.

I have quoted at length, for I am not alone in thinking that the double Mot has much to recommend it, and I must adduce one or two other considerations.

Even admitting what is urged, there are, I think, conditions where the substitution of one bullock, thereby freeing another for other work, may be a gain.

One bucket balances the other, and so the net weight of water is all that has to be raised, and not the water *plus* the bucket. This being so, the bucket might be made heavier and of better material, say iron, without imposing additional work on the animal.

Again, the unnatural progress of the animal in the most usual variety of the ordinary Mot, backing up the inclined plane, is considered by some practical men detrimental to the bullock, and makes him unserviceable sooner.

(2). THE PERSIAN WHEEL.—"I have not yet found a Persian wheel," says Mr. Campbell, "which raised anything like the quantity it ought to do when worked by bullock power, and I do not consider it a sufficiently perfect machine to be placed in serious competition economically with a Mot." He refers especially to the oscillation of the different chains of buckets which is always going on, and which causes interference and fracture of the buckets.

(3). THE BURGESS BUCKET LIFT is rightly described, I think, as a perfected Persian wheel, and as the best and simplest of the water-lifts of European construction which have been recommended. But, on the other hand, though it is shown that its efficiency is greater than that of the Mot, its cost and repair counterbalance the gain. I believe in the Burgess Bucket lift, where the depth of the water is not greater than 20 feet. At a greater depth the oscillation of the buckets makes it practically unworkable without great risk by an ordinary native. Again it does not suit wells, the water-level of which sinks rapidly during the working hours of the day. The adjustment of the buckets is too great a tax on a paid labourer. Still the machine is well known, and if it is really an improvement, it will extend its use without Government encouragement.

(4). HARTFORD'S WINDMILL OR CALIFORNIAN PUMP.—A number of trials made have not given satisfactory results. To make it do the work of a pair of bullocks with a bag, a larger machine than those experimented with would have to be used, and this fact alone would oust it from competition with the Mot.

Other machines are referred to—*e.g.*, the CHAIN PUMP, STEAM MACHINES, &c., —but none of them fulfil all the conditions laid down, which indeed are all just and necessary.

I must quote Mr. Campbell's last paragraph—

"All the different varieties of water-lifts worthy of notice have now been described and compared, and it appears that for simplicity and economy in results none can surpass the ordinary leathern bag worked by bullocks, and this must be necessarily so in a country where animals as a motive power are so cheap and the machine used is so simple that it produces at least 90 per cent. of the power employed in working it. This is not the case in any other water-lift that has been brought forward as yet."

There are, however, at least two varieties of the ordinary Mot, and the question has to be considered whether the special features of the Mot of one district could not with profit be introduced into another. Here, again, Mr. Campbell decides in the negative.

In Gujarát there are the *Rámio* and the *Sundio* Mots. The bag in the former has no spout or trunk, and so it requires a special man to draw it on the trough and empty it. The latter has a spout, and is more self-acting. It empties itself by means of a separate chord fastened to the spout and attached to the yoke.

In both cases, where the amount of water required is very large, two pairs of bullocks are used working alternately; at the end of each trip the rope is disengaged from the yoke immediately the bag has been emptied, and is run back quickly by hand into the well, refilled and attached to the other pair, which is standing ready, the first pair in the meanwhile coming up leisurely to the starting point.

Where the wells have an average lift of 40 feet, it is almost invariably the custom to unhitch the rope and walk the bullocks up to the starting point; but when the lift is low, they are made to "back" up the slope.

In the Deccan the Mot is like the *Sundio* of Gujarát, though generally larger. Each bag is worked by two pairs of small bullocks yoked one pair front of the other, and often two bags are worked side by side together by one driver, who manages the 4 pairs of well-trained animals alone, thus economizing greatly in the number of men required as compared with the usual practice of Gujarát.

Such are the differences of practice, and I am satisfied that Mr. Campbell's decision is right. The varieties are modifications of one pattern, and each one possesses advantages which are suited to the circumstances under which they are worked, and which have been gradually developed to meet certain peculiarities which prevail naturally in the two different countries. The cattle of Gujarát are larger, stouter, better fed and brisker than those of the Deccan. These qualities are utilized to the best advantage in the *Rámio* pattern. The plan of unhitching the pair of animals at the end of the run would not answer, were two pairs worked tandem as is the custom in the Deccan, for the time lost in getting the two pairs into proper position before re-attaching the rope would neutralize the only advantage of that pattern.

39. (4). *A hydrographic survey to record the depths of water-levels on village maps would be of no help;* to the rayat of Gujarát, for he does not require it, or to the rayat of the Deccan, because the level is so variable and the surface of the country so uneven that the cost would be totally incommensurate with the results secured.

40. I offer no apology for the length of the extracts taken from Mr. Campbell's report. It is of the highest value, and an invaluable guide to me in the performance of the duties assigned to my Department, when no subject is more frequently urged on my notice than that which in its various phases has been dealt with by the report.

41. In connection with the subject of irrigation an important ruling has been vouchsafed by Government, which must find full record in this report.

A landowner of the Kaira District collected a fund of Rs. 40,000 in order to purchase steam machinery to raise water from a river and to make the necessary distribution channels to conduct the water to his land. As encouragement he asked for special exemption from the water rates leviable under Section 55 of the Land Revenue Code and a guarantee against enhancement of assessment based

on the consequent increased fertility of his land when a revision settlement takes place.

In this particular case it was found that the land was situated within the limits of a village held on the *udhad* tenure, and the applicant was necessarily left to make his own arrangements with the holder of the village. The general question, however, was brought before Government, whether in a similar case Government would be prepared to make special concessions of the character of those asked for in this case, with a view to encourage private enterprize.

The Collector argued that there was nothing wonderful or experimental in pumping up water by the aid of machinery, that it was simply a matter of capital and cost, for which a proportionate return was certain, that it was unlike a reclamation of waste or salt lands, where capital is spent with perhaps a very doubtful chance of success, that if the petitioner had found out some new invention by which water could be drawn up cheaply, and by rich and poor alike, he would have a just claim on a substantial concession as a fitting recognition of his enterprize; but that no such claim could be entertained in the present case, because the poorer cultivators could never imitate the steam pump.

The Commissioner contended that though the Collector had given, fairly enough, one view of the subject, there was another aspect—that the value of intelligent experiments could not be well over-estimated, that there was a large amount of capital in Gujarát ready to be put into any enterprize which could offer an assured financial success, but that there was probably no country where speculative improvements were so much distrusted, and where special need therefore existed for assistance in the development of new industries. In submitting the papers to Government, I urged that the financial success of the outlay of capital was by no means certain, and adduced in support of the principle the advice offered by the Famine Commission (Report, Part II., p. 145,) that, in order to encourage private enterprize, it should be formally laid down that the landowner shall be guaranteed against any enhancement of assessment for such period as shall secure to him such reasonable return on his investment as will encourage the prosecution of improvements.

Government Resolution No. 5428 dated 3rd July 1885.

Government ruled that the answer to the question raised must depend on the nature of the project for utilizing the water. "If there is abundance of water available, which would not be utilized otherwise and if the works required for utilizing it are costly and the difficulties to be overcome considerable, or the result uncertain, Government would be prepared to assist the projector by giving the water free for a term of years or at a low rate."

Steam machinery for irrigation has been successfully introduced on the Fuleli Canal near Haidarabad in Sind. Here the example was set by the Government Experimental Farm, where the enterprize was carried through the experimental stage.

Government Resolution No. 146 W. I.—349 of 31st July 1885, Public Works Department, Irrigation.

42. A precedent has been established with regard to the sub-division of survey numbers for convenience of dealing with applications for water under the canals administered by the Irrigation Department which has an important bearing on the future operations of the Agricultural Department and on the correctness of statistics of irrigation. Mr. Burke, Executive Engineer in charge of the Nira Canal, has introduced a system of dividing survey numbers into subordinate irrigation numbers, marked with stones, coloured red with *shendur* or red-lead to distinguish them from the survey marks. The system will save the annual measurements of the irrigated area, and will be a safeguard against fraud, and consequently against incorrect returns. The Survey Commissioner has accorded his approval to the plan, with the provisos that neither the cultivators nor the village officers shall be saddled with any responsibility with regard to the maintenance and repair of the special marks, and that the distinctive colouring shall be efficiently provided for.

V.—AGRICULTURAL EXPERIMENTS INCLUDING FARMS.

43. Under this head I shall maintain the order of last year's Report.

A.—EXPERIMENTAL FARMS.

44. The Progress Reports of the Bhadgaon and Haidarabad Farms were printed, but were not circulated according to the Distribution List of Agricultural Reports, &c., as the principle must be maintained that the thread of the narrative of the operations of the farms shall be carried unbroken through the Annual Reports. These were distributed before the end of July, or a month earlier than last year. The farms still remain under the Collectors of the Districts in which they are situated (see para. 17, last year's Report).

The Bhadgaon Farm.

45. I visited this farm twice. Mr. Stormont has been in charge throughout the year, assisted by Mr. Dádina, a graduate of the Madras Agricultural College. An extra clerk on Rs. 25 has been sanctioned, and to the post Mr. Desái, another graduate of the same college, has been appointed. The pay is nominal in his case, and his object is to gain practical knowledge of farming to fit himself for a higher post when available. An apprentice, Mr. Navroji, another graduate of the Madras College, has lately joined with the same object. All these, though taught at Madras, belong to the Bombay Presidency, and will with experience later on become valuable additions to the Revenue Agricultural Staff when it is extended to Gujarát, or will be available for the charge of agricultural experimental stations subordinate to the farms when the time arrives for the establishment of such. Mr. Dádina has profited by his experience, and his presence is a guarantee for the accuracy of experimental work, at the same time freeing Mr. Stormont for occasional tours. The latter made a tour in February through the cotton districts, and has found time for another tour since the date of his report. I am satisfied that a commencement has been made on the farm in properly conducted careful experiment. The report has been fully reviewed by me, and I shall notice only the most salient results in this paragraph with regard to those heads which are not discussed under separate sections.

Manures.

Green manure.—Green hemp (crotolária) showed no effect in increasing the outturn of wheat,—a result which demands further attention. It is urged that this form of manuring was in fashion (in Europe), but has now few advocates. This is not to the point. In this country green manuring is practised, and it is very essential to test its value with a view, later on, to guide its use, and extend it if found advisable. The Superintendent has been directed to ascertain the local usages of green manuring, and to institute experiments on the farm accordingly. In the face of the growing difficulty of providing manure in this country and of the absolute necessity of showing, slowly and after many failures though it be, how the use of manure may be made to increase production, the importance of green manures is not to be underrated, even though in Europe better results are obtained by the use of chemical and other manures. I notice that green soiling with hemp for wheat did not succeed on the Nágpur Farm this year (*vide* Nágpur Farm Report, para. 12). The reason appears to have been the poorness of the hemp crop, and perhaps this green manure is not suitable for wheat.

Cowdung ashes.—The Superintendent deduces from an experiment made with plots of gram manured respectively with cowdung and the ashes of an equal quantity of dung, that in burning cowdung the cultivator loses something, yet that by restoring the ashes to the soil he can secure very slightly inferior results. The principle, though quite correct, is overstated. The something which is lost is the nitrogenous constituents which are volatile, but they are all important, though, no doubt, more so with cereals than with pulses. Here the opportunity of teaching a most valuable lesson offers itself. The people do, as far as my enquiries have yet shown, neglect the use of ashes. The small superiority of the plot treated with fresh dung is partly due to the fact that ashes are in a more readily assimilable condition than fresh cowdung. The difference will be more accentuated when the results of the next year's crop on the same plot are reported.

Not only is it advisable to seek to teach the value of ashes, but the experiments must be directed to demonstrate the difference in the value of cowdung

according to the manner in which it is preserved, and to the condition of the animals which provide it. The truths I wish to see demonstrated clearly are that (1) it will pay the cultivator to take trouble with the proper preservation of the cowdung, and (2) it will pay him to choose for domestic purposes the droppings of ill-fed, old, and hard-worked animals, restoring the ashes to the soil. The well-preserved dung of milch cattle and other well-fed beasts is far too valuable as manure to allow him to expect anything like the return from the ashes that it is within his power to secure from the fresh or well-kept manure.

I believe that further enquiry will show that these principles are better known than I am now aware of; but the customs of providing no litter for housed cattle, and of leaving the droppings to ferment unchecked, at any rate are features which demand reform, if practicable.

In another plot the lasting effect of cowdung well preserved, as it is on the farm, is well exemplified. Jowári after a cowdung manured crop of sugarcane yielded 44 per cent. more than after gram, though the value of gram as a preparatory crop is well known. I venture to assert that no such result would have been seen if poudrette had been the manure for the sugarcane.

The same value of cowdung is still more vividly exhibited in a plot of til, following sugarcane, manured with dung, where the outturn was 100 per cent. better than in the plot after gram.

Tillage as manure.

Closely allied to the direct uses of manure is the experiment on the cultivation of wheat known as the Lois Weedon cultivation. This is in its first stage, and its value cannot be judged from one year's experiment. The system is fully described, and as far as it has gone gives hope of valuable results. Though successful growth of unmanured wheat continuously has been proved impracticable in England, except under the Lois Weedon system, it is without it a marked feature of large wheat tracts of India, and even of parts of the Bombay Presidency. It will be my aim, later on, to attempt to ascertain whether a modified application of the principle of the substitution of tillage for manure, which is the underlying object of the system now under trial, cannot be successfully introduced into districts where wheat is grown now continuously, but with a small yield.

Use of pickles to prevent smut (kanhi).

Sulphate of copper and common salt were used to pickle jowári seed before sowing. Jowári in this country shows a very great liability to serious injury from smut, which, however, apparently does not much injure wheat. The disease is preventible, but the use of pickles must be taught. It cannot be dictated. An attempt at dictation was made by publishing and freely circulating a paper I prepared on the subject. Though I was questioned by a few, I have no evidence that any one thought the advice worth following. The result was fairly satisfactory on the farm; but, as it happened, the season was unusually favourable to jowári, and even in unpickled plots it received slight damage. Attention will be directed to the value of the preventive when a bad smut year comes. One pickle, human urine, has advocates. It was not tried, but I think that other urine should be experimented with, for obvious reasons. Experiments with selected seed wheat of indigenous and foreign varieties, with Nankin cotton, on ensilage and on machinery will be noticed under separate heads.

Other miscellaneous experiments will be noticed briefly.

Sorghum.—Two varieties: (1) amber cane recently introduced from America, (2) Chinese sorghum long grown on the farm. The yield was good, but in the absence of proper appliances sugar was not made, and the juice refused to become jágri. I think that Cook's evaporator,—found successful both at Cawnpore and at Nágpur,—must now be tried; and the Superintendent has been requested to obtain the pan at least. It is worth the trial to ascertain whether these crops cannot be successfully and profitably grown for sugar production, the crushed cane being used as cattle food. It is a question whether the Superintendent

was right in allowing the crop to seed. On this point there is plenty of guidance available in the trials made in America.

Maize.—Four American varieties were tried again, and this time under very favourable conditions, but with no success. On the other hand, the good local variety as well as varieties grown in Sátára and Sholápur, which have an excellent repute, did well. Eight other varieties, from Australia chiefly, showed inferior results. This superiority of indigenous over imported varieties was also exemplified in the case of wheat, as will be noticed in its place.

Golden Plantains again did well. The variety is excellent, but there is no sale on the farm, and it does not pay to send the fruit to Bombay. Shoots are distributed gratis or at a low cost.

Italian Turnips, the seed of which was supplied by the Government of India, promise well, and it is presumed that care has been taken to keep seed for further trial and for distribution.

Tobacco of an acclimatized Shiráz variety produced a fine crop and paid well. Seed is available for distribution.

As regards arboriculture, the *divi divi* seed continues in demand. Tanning experiments with the pods are in progress. The tree has, no doubt, proved a success, and would pay private garden owners if grown near water-courses. Its success has also been assured in Dhárwár, and it is being largely planted in the Southern Forest Circle. *Arabian Date Palms* thrive well, but it has been decided, as soon as suckers are available, to test their value in Surat and other districts where the ordinary date plam flourishes. It is in uncongenial climate in Khándesh.

The *Carob tree* may be now abandoned as valueless, and so may the *Rain tree* (Pithecolobium saman).

The general operations on the farm with regard to staple crops were fairly successful, save and except in the case of cotton. The report shows that the season was very bad for cotton, and it forms no exception from the result of several seasons past. The difference between a bad and a good season is well exhibited—the latter showing a money return of 4½ times the former. The succession of bad cotton seasons in Khándesh—where cotton is the chief support of the people—is very melancholy.

Live Stock—Cattle.

The object in view of weeding out crosses and confining attention to the pure Khilári Breed is being gradually, but surely, secured. New bulls are needed, but the opportunity of obtaining them has not yet offered. Three good bulls of other breeds were presented to the Ahmadnagar Local Fund Committee for use in that district

The Aden Herd has done well. The advice of the Commissioner was followed with a good result. It was that they should be kept in the byres and fed with cake and seed, with a limited allowance of grass. Full profit cannot be obtained on the farm, as there is no sale for the milk, and no satisfactory arrangement can be made, unless the cows can be sent to Poona. A proposal has been made to the Principal of the College of Science that the herd should be removed to the College Farm.

Sheep.—The cross breed between the dumba of Sind and the Khándesh sheep thrives, but there is great difficulty in disposing of the rams, and considerable loss occurs from the presence of too many rams addicted to inveterate fighting.

The Haidarabad Farm, Sind.

46. I saw this farm for the first time in November last. The result of my visit was chiefly this—that the re-organization scheme sanctioned for the Bhadgaon Farm was found applicable in its principal aspect to the Sind Farm. The forms and registers sanctioned for Khándesh were adopted, and an Assistant Superintendent appointed to aid the Superintendent in the minute details of experi-

mental work and to free him for study in the neighbourhood of the farm the local methods of cultivation. As long as the Superintendent of an Experimental Farm is confined within its four corners, his work must to a great extent be work in the dark.

The farm has now been laid out anew to suit the requirements of experimental work. The re-division of the lands had, owing to the new roads, water-channels and buildings, become imperatively necessary. These permanent improvements are now all but completed, and continuous careful experimental work will proceed.

I cannot be too careful, however, to record that the conversion of the land long uncultivated, intersected with small water-courses, covered with brick kilns and the stumps and roots of old trees, with here and there mounds of drift sand and with an upper layer of soil matted with deep-rooted grasses into a level area suitable for the irrigation cultivation of Sind, has exposed much sour soil, which must sweeten before it is fit to produce good crops, and must become more even in quality by weathering before comparative experiment can be trustworthy. The unevenness of the plots for the present prevents deductions from some sorts of experiments—a notice of which will here be avoided.

Selection of Seed.

Mr. Strachan, the Superintendent, has devoted much time and attention to the practical exemplification of the benefit of care in selecting seed, especially with respect to bájri, a staple of the district. His selection was begun 10 years ago on the old site of the farm. He picked out several apparently distinct varieties of bájri. These he grows year by year, but each year he collects from the selected separated varieties the best spikes, and from these grows a mixed selected crop. At first he thought that the separate varieties showed the best results, but now he is inclined to think that the mixed selected seed is the best. It matters little. There is selection in both cases, and the superiority of the farm bájri seed is very marked and has attracted attention, which is the first step towards imitation.

I advised the selection of the seed from the middle of the best formed and plumpest spikes. The Superintendent has adduced the results of trials in America with maize, where the decision was that the tip kernels yielded quite as good seed as the centre kernels. I have directed that comparative experiments be made to ascertain whether facts found true for maize will be borne out with respect to bájri. If this is proved, it will be important, for then the larger grains may be sold and the smaller kept for seed. I am aware that in selecting seed for wheat in some parts of England the farmer chooses the small grains, but I much doubt the wisdom of the plan. Certainly pedigree seed-growers would not approve it, and they are presumably educated in the matter by experience. Selection as regards cotton has been continued. Some results were reported last year, but the opinions of experts have not as yet been obtained with respect to the last season's crop, and, moreover, the selected seed plots being more advanced, received the larger hurt from an injurious frost. The plants from the selected seed do not ripen so early, but the pods are larger and more numerous, and the outturn is better. The quality is also superior.

Manures.

Comparative experiments are as yet unsatisfactory. On tobacco last year poudrette and goat dung were tried. The experiment went to show that the latter has little superiority. This year cowdung was pitted against goat manure, the locally approved fertilizer for this crop, with the result of corroborating local empirical experience. It would be unwise, however, to lay much stress on these results.

Tillage as manure.

The Lois Weedon wheat culture was commenced as at Bhadgaon. Here, as there, no deductions can be drawn from a single trial, especially as the condition of the land is so variable as to make the figures very doubtful. Mr. Strachan, however, is of opinion that the local peculiarities of cultivation, in which

perennial weeds give much trouble, may be greatly benefited by the system extended to other crops which, like wheat, repay good tillage. This remains to be seen.

Experiments on varieties of Crops.

Juwár.—A large number of varieties were tried last year. The Alakh sort did best. The season this year was very unfavourable, and no results were obtained.

Tobacco.—No less than 18 kinds were sown. In spite of unevenness in the quality of the land the Manilla variety gave the best crop. Mycrophylla, which secured the first place last year, was good again, but was found inferior to several new kinds.

Buck Wheat completely failed. *Mangolds* and *Carrots* give promise of success. *Lucerne* is well established, and financially was very profitable. The *Bourbon* cotton is attracting attention.

Potatoes were successfully grown last year, and, in order to preserve seed tubers for this season, the English method of pitting was tried, with the result that not one remained sound. The Superintendent has been advised to search and see whether local experience cannot suggest a more suitable method. Meanwhile fresh seed of the good Poona variety of potatoes has been sent to the farm.

I would notice prominently experiments of interest which are in the first stage—

(1.) A test experiment to show whether the alleged superiority for seed of the produce of 5 and 4-celled capsules of cotton over the 3-lobed capsules is real.

(2.) A similar experiment to show whether Mr. Strachan is right in his theory, that the shade of colour of the Nankin cotton can be regulated by the selection for seed from pods producing cotton of any desired shade.

(3.) An experiment on the continuous growth as compared with the rotation growth of tobacco. The former is the practice of the rayat, and is considered by him essential to secure a superior crop. The latter is more in accordance with ordinary scientific principles. The general crops of the farm (cotton, til (sesamum) and bájri) repaid cultivation—except jowári, which failed.

A new feature has been introduced by the receipt of bushel measures—both at this and the Khándesh Farm. The quality of many crops is well exhibited by the bushel weight, and this will be a point for invariable record.

The College of Science Farm.

47. Mr. Woodrow, who was last year in charge of the Botanical Gardens at Ganesh Khind, has been appointed Lecturer in Agriculture and Botany at the College of Science, chiefly with the object of improving the agricultural instruction of the Institution. The college has a farm of 70 acres, which is being brought into shape. About 12 acres have for some years been well cultivated, but the rest is new land. Some of the experiments on the farm deserve record.

Crotolaria juncea (tág) was used as a green manure for jowári with success. This green manure, as noticed above, did not give good results on wheat; and, as hinted (para. 45), the real reason may be that wheat delights in a firm bed—an admitted fact,—and does not thrive on the fresh furrow necessitated by the ploughing in of the green manure.

Sugarcane.—All experiments with this crop in the vicinity of Poona are of special value, seeing that it is the favourite one under canal irrigation. It would have been, I think, more satisfactory if Mr. Woodrow had gone into far greater detail on the subject, and I hope he will direct his experiments to demonstrate the shortcomings of the locally approved cultivation of this important crop.

He throws out a suggestion that thin planting may be more profitable. Experiment on thin and thick planting, with comparative figures, will not be lost on the intelligent sugarcane growers of the neighbourhood.

Further, he hints that the rotation in vogue is capable of improvement.

Jowári.—A large number (23) of kinds was sown. Most of these showed inferiority in comparison with local varieties. One sort from Bilichigan stood out ahead of the rest. No doubt further trials will be made. I must say that the jowári I see around Poona, grown chiefly for fodder, is very miserable, and Mr. Woodrow may be able to introduce better kinds.

The *Oat* crop, from seed procured from Natal, produced good results. 2,200 lbs of grain per acre, or about 54 bushels,—a yield in excess of the average in England. The yield of straw is not stated; but it was, I know, large. Gram as a second crop after bájri cut early for ensilage, gave 650 lbs. per acre,—a good yield for the locality, where gram is not a successful crop.

The Herbarium and College Botanical Gardens are interesting features of the Report.

Since the closure of the Botanical Gardens, Ganesh Khind, the distribution of mango grafts has been carried on at the College of Science Farm. The Soldiers' Gardens on its new footing will also as soon as possible take up this important work.

A long list of famous mango trees has been prepared from reports from every district. Mr. Woodrow at the College Farm and Mr. Stormont at Bhadgaon evince interest in this matter. The latter remarks that if even one-fourth of the common mango trees of the country could be replaced by grafts of good trees, an enormous gain to the country would be secured.

The Nadia'd Farm.

48. This is a private institution of some years' standing supported entirely by a local Committee of agriculturists. The experiments conducted, though of great practical utility to the observant members of the Association, are not reported with sufficient detail or accuracy for notice here. But I look on the work of the farm with great interest. It is a spontaneous outcome of the growing desire to improve local methods of farming. The Association has accepted the prescribed forms for the Government farms, and I anticipate valuable results later on. The farm is only 12 acres, but is in the centre of one of the finest districts of Gujarát.

B.—General Principles of Agricultural Experiment.

49. The abortive attempt to establish a Central Farm at Dápuri, near Poona, was noticed last year (Report, para. 32). The project of a Central School of Agriculture is, therefore, deferred, and so must the project for a Central Farm; for I am convinced that till the recommendation of the Calcutta Conference is accepted, further extension of the principles for experiment cannot be profitably made. What is wanted is a Central Farm presided over by a competent agricultural chemist, who would guide the experiments both on the Central Farm and on the other farms in the Province. The Science College is quite suitable for all purposes of a Central School of Agriculture, and the farm with small extension is also suitable as the Central Farm. The chemist is the difficulty. The Calcutta Conference decided that each Province cannot afford to employ a first-rate agricultural chemist, and so approved of the alternative of asking the Government of India to provide such an officer as Consulting Agricultural Chemist to the Government of India. That appointment once made, it would not be difficult for each Province to supply itself within its means with an agricultural chemist competent to take charge of a Central Farm assisted by a Superintendent with local practical experience in farming, and to guide the experimental work of the other farms and experimental stations. The material is at hand. Natives from almost every Province have learnt theoretical agriculture at the Royal Agricultural College at Cirencester and the principles of English practice. These have also mastered the main principles of agricultural chemistry. This is the best material to work on; and such men, provided they have the sympathy and guidance of a highly trained agricultural chemist in India, will soon, with the co-operation of the Director of Agriculture of the Province,

Government Resolution No. 1024, dated 3rd February 1885.

bring agricultural experiment into fair competition with the work done in other countries.

50. There is a tendency in India, it appears to me, to suppose that any chemist must be to some extent able to teach agricultural chemistry, and that any analytical chemist must be competent to analyse soils and agricultural products, and to guide scientific agricultural experiment. No error could be more fatal. Agricultural chemistry is an independent science, demanding, it is true, a thorough knowledge of the principles of general chemistry, but also as thorough a knowledge of the principles of practical agriculture. The want of scientific direction by a specialist in the matter of experiment is evidenced by the various and often contradictory aims of the experimental farms of India. A perusal of the farm reports is sufficient to prove this. No doubt local conditions cause variations, but there is now little accord in the course pursued in different Provinces. The labours in one place do not aid those in another. There is no joint action. The object of the Calcutta Conference was to stimulate joint action and uniformity of aim. But the individual opinions of the Directors in different Provinces are causing the rapid obliteration of uniformity of principle and practice. Madras has even abandoned its Experimental Farm, and such may be the fate of the farms of other Presidencies, unless the Department of Agricultural Experiment is organized on a sound basis. The appointment of a Consulting Chemist under the Government of India would make it possible for the Supreme Government to review the progress of experimental work all over the country—to collate results—to suggest new fields of experiment—to prevent expenditure of time and money in the elucidation of main principles already thoroughly established, and requiring no further elucidation: and, to sum up, to enable the Agricultural Department of one Province to profit by the results gained in another.

51. At present the reports of the farms and agri-horticultural gardens are printed and spread broadcast over the country, and beyond it. The mass of literature on agricultural subjects is becoming too great. No one has the time to read half what is put before him, and often one reads a great deal with the feeling that it is profitless. This is not because the matter is valueless, but because it is undigested. Far better would it be if the Government of India could substitute for this general distribution of agricultural reports, pamphlets and the like, a short digest of the work done in the country every year. The digest, if prepared by such a man as the Consulting Agricultural Chemist to the Government of India should be, would be invaluable to each officer intrusted with the conduct of experiment, and would secure respect from the Agricultural Departments of other countries.

52. In writing this I do not forget that the Government of India has wisely and deliberately directed that agricultural enquiry should precede experiment; but experimental work is long and slow, and the beginnings must be made, indeed have been made, and enquiry not followed up by experiment will be feeble and lifeless.

C.—Special Experiments.

53. The *Crop experiments* by Revenue officers have been carried out as usual, but this year for the first time under the revised rules printed in the Appendix of last year's Report. The review of the work done will be separately reported to Government.

54. *Rab experiments* have been exclusively carried out by the Agricultural Department, though with the aid of the Mámlatdárs. Several officers of the Revenue and Forest Departments have shown interest in their conduct. The report will be made when the harvest is reaped.

55. *Corrymony Fence.*—The trial of this wire fence under orders from the Government of India was not carried out owing to the retrenchment Resolution. But arrangements have been made to have the trial conducted by the Principal of the College of Science, a suitable site for the experiment being afforded by the unenclosed portion of the College Farm.

D.—Experiments on various Indigenous and Exotic Products.

(a).—*Indigenous.*

Distribution of selected seed.

56. **Wheat.**—The steps which led to the attempt to improve the staple by distributing handpicked selected seed were described last year. The distribution was general throughout all the principal wheat districts, but the time chosen was unsuitable. The handpicking was done in Bombay during the monsoon, and the wheat sent by rail and road to its destination. The result was disastrous. Nearly all the wheat reached the cultivators badly damaged by weevil. Much was quite unfit for sowing, and was sold. The soft varieties suffered more than the hard. Added to this, the wheat crop was almost a complete failure in the selected tracts of the Southern Marátha Country, and in the Deccan it suffered everywhere from rust. No benefit therefore accrued from the distribution in these two provinces. In Gujarát the season was excellent, and in spite of the weevils success was attained in Surat.

Here the soft white variety, which is most in demand in the export market, though it was at first looked on with suspicion by the rayats, yielded so well in quantity and quality that a spontaneous demand for further supply of seed was made. The demand was, of course, readily complied with.

On the High School Farm at Surat the quality both of hard white and hard red was excellent, and secured for the produce first prizes at the Nadiád Show; but the outturn was considerably below that of the indigenous variety.

Careful experiments with unweevilled samples of the handpicked selected seed of all four varieties were made at the Bhadgaon and Sind Farms. As to quality and weight the results were good. At the Bhadgaon Farm each variety was grown both as an irrigated and as a dry crop. The weights per bushel were:—

Varieties.	Selected.		Indigenous.	
	Irrigated.	Dry-crop.	Irrigated.	Dry-crop.
	Lbs.	Lbs.	Lbs.	Lbs.
Hard red ...	63	63¾	57	61
Soft red ...	64½	66¾	...	...
Hard white ...	...	63⅜	61½	61
Soft white ...	64⅜	65⅞	...	...

It must be noticed that the indigenous varieties are hard white in irrigated and hard red in dry-crop land. Soft varieties are not grown; and though the selected kinds kept their colour, there is no doubt that the consistency of the soft wheats has even in one year considerably and markedly increased in hardness.

The acre yield was disappointing. I will not quote the figures, because only 47 lbs. of seed were sown per acre of the selected kinds as against 70 lbs. of the indigenous. Still the outturn of the latter was nearly double that of the former.

In Sind the selected kinds of hard wheat were so damaged by rust that the outturn was unrecognizable. The soft kinds suffered also more than the indigenous soft varieties. The yield was not reported, but the absence of rust among the indigenous wheats, and the powerlessness of resistance displayed by the selected ones, leave little hope of good result from further distribution. Moreover, the indigenous wheats in Sind, chiefly soft white and soft red, are excellent, and perhaps even superior to the selected kinds distributed.

57. Before these results came to my knowledge I had, with a view to avoid the chief cause of failure—weevil—in the former distribution, arranged that the seed

should be collected, handpicked and stored before the monsoon in the tracts chosen for a repetition of the experiment. In this plan I received the full support of the Chamber of Commerce, but before the time came circumstances developed themselves which deterred me from a second attempt at any general distribution. These were, first, the fine crop of Gujarát, which would naturally cause the people to be chary about putting down uncertain seed when their own was so good; and next my rising conviction that the plan of handpicking and distributing seed, so liable to change in character and quality and so difficult to preserve in a sound state, is bad. At the same time the great failure of the crop in the Kánarese Districts induced me to concentrate my efforts there, for not only would good seed be welcomed, but there was every probability that there would be a deficiency of seed, good or bad. I therefore purchased as much good seed in the Dhárwár District as the Collectors of Belgaum and Bijápur thought safe, and had it conveyed in bags mixed with dry ashes and stored at the several head-quarter stations of the selected tálukás, in order that at sowing time it might be sold to the cultivators sound and good.

My letter No. 998 dated 24th July 1885.

58. In my report I summed up the result of the experience gained as follows:—

"I think there is evidence that general distributions of seed wheat are unadvisable. The first year's yield at any rate is low; and if the rayats are to be told that they must wait to see results the second year, the distribution cannot be popular. There is no doubt that the great liability to weevil and the variable consistency of this grain at once go far to negative the utility of the plan. The cost of handpicking is very high, and of carriage quite incommensurate with the results likely to be obtained. The use of selected seed must be taught by the progress of the wheat export. The principle the people know well enough. The practice will arise as the people see the advantage. Meanwhile no opportunity should be lost of supplying seed, and at the same time good selected seed, whenever there is a likelihood of a scarcity such as there is in Bijápur and Belgaum this year."

59. I now intend to await the results of further experiments on the farms with the produce of the crop grown from the selected seed, but at the same time to be ready to supply good seed when a deficiency of seed is likely to assist its distribution.

Change in Colour and Consistency of Whea .

60. Intimately related to the question of improving the wheat crop, by distribution of good samples of varieties in export demand, is the question how far the colour and consistency of the grain can be preserved. If these characteristics are proved to be incapable of preservation under altered conditions of climate, soil and rainfall, it stands to reason that the distribution of selected kinds, even if these can claim the name of pedigreed kinds, cannot be successful.

I wish therefore to bring into prominence the facts elicited bearing on this subject.

1. As to consistency.

(1). I plucked with my own hand an ear of wheat, which contained 35 soft and 9 hard grains. The variety was Bakshi (hard white).

(2). In the produce of the soft white wheats sown on the farms and personally by me in Poona, several hard grains can be detected. In my own experiment I most carefully examined the seed before sowing.

(3). So in the hard kinds, numerous softish and some soft grains are often apparent.

(4). Where soft wheat has been sown in districts of hard wheat, the produce even in one year is markedly harder than the seed sown.

(5). It is the universal belief of the people that the hard wheats become *potha*, literally bellied, *i.e.*, softish, if rain falls when the crop is in ear. The Kánarese equivalent for the Maráthi word *potha* is *hotte*. This word also means bellied. The applicability of the term is evident when a sample is examined.

61. I am carefully preserving samples in air-tight bottles into which a small quantity of quicksilver has been introduced to preserve the grains from

weevil, so that year by year the alteration in consistency may be observed. I tried to keep samples by washing them with corrosive sublimate, but the poison completely changed the colour. The quicksilver preventive has been adopted from a custom prevalent in Gujarát to preserve seed wheat.

2. As to colour.

62. The change of colour is apparently not so rapid as that of consistency. In Khándesh, side by side on the farm, hard red in dry-crop and hard white wheat in irrigated land are produced without any marked change. Here the climate and soil are constant. The only difference is the variety of wheat and the irrigation in one case and not in the other. This year, when both varieties were grown with and without irrigation, the colour is unaltered. I have, however, a sample of the grains of one ear which have a decidedly red tinge. On the other hand, when hard red is made *potha* by unseasonable rain, the colour nearly approaches that of a white wheat.

Dr. Fairbank in the Ahmadnagar District found in a field of Bakshi (a hard white, long-arched, irrigated variety) specimens of club-shaped soft red. Soft red is not grown anywhere in the neighbourhood. The Pátil who grew the wheat is a careful cultivator and cannot account for the phenomenon. Here complete change in colour and consistency *and shape* occurred, unless perchance —which as I say is very improbable—a grain of soft red was sown.

63. As regards shape I have noticed some curious facts. It seems to me that when the soft white club-shaped wheat is grown where the long-arched hard white is indigenous, the grains which show a tendency to hardness also show a tendency to elongation. I shall watch the point but have no more to say now.

Trials with foreign wheats.

64. The next subject is whether it will improve the wheat of the country to import pedigree seed from abroad. Three varieties of excellent English wheat were presented by Messrs. Oakshott & Co. to the Secretary of State, and I was directed to give them a full trial. This I have done. I tried them on the Bhadgaon Farm both with and without irrigation. The result was total failure. The wheats pedigreed in England no doubt produce full crops there, but transported to India they yield nothing at all. The seed was put in in excellent condition. The season was favourable to wheat. I admit that it is probable that if seed had been secured, in a few years the English varieties might have been acclimatized, or educated to suit altered conditions, but such education would undo the work of years of careful cultivation in England. This one experiment justifies a polite refusal to any attempt to meet the desire of English seedsmen to extend their custom to India.

I have, however, received through the Bombay Chamber of Commerce from South Australia 4 very fine varieties of prize seed wheat, all soft white. They came too late for last year's sowing, but are now being put in at the two farms and in Poona. The seed has been successfully kept sound. I cannot anticipate results.

Government Resolution No. 4494 dated 14th June 1883.

On the Bhadgaon Farm an experiment was made with some Australian wheat (beardless wheat) which is used in its own country as a fodder crop. At the direction of Sir James Fergusson this wheat was grown in 24 acres of the best land available. Most was sown as dry-crop; for, if it requires irrigation, it cannot compete with local fodder crops. As soon as the rains were over it showed signs of distress. All was irrigated to save it except one acre. But little improvement was apparent. The dry acre seemed hopeless. There was a very unusual fall of rain in December. The crop quickly revived and grew strong and healthy. It was cut before ripening, and pressed into bales according to directions. The acre which had not been irrigated even recovered partially and gave a small quantity of straw. Two acres of the crop were allowed to ripen. The seed is being kept for further trial, but it is damaged by rust, and is of very poor quality even irrespective of this fact.

The pressed wheat hay has been made over to the Commissariat Department for trial as a food stuff. Its yield was no less than $1\frac{1}{4}$ tons per acre.

Apparently the trial was as successful as could have been expected, but all success is due to the abnormal rainfall of December, without which the crop would have perished.

The value of wheat straw as fodder is less than that of oats or barley. Oats can be grown very well in this country, and I anticipate little practical benefit from the Australian wheat hay.

65. The net result of the above considerations is that there is not any well-founded hope of improving the staple either by distribution of seed wheat, collected in favoured localities which produce a variety in export demand, or by importing pedigree seed from abroad. Yet it would be unwise to abandon attempts in this direction altogether, and my action in the matter cannot be considered as abandonment. I claim further time for experiment on the farms, and such experiment will be the only safe guide to further prosecution of the plan recommended by so high an authority as the Chamber of Commerce.

66. I have hinted at other methods of improvement, *e. g.*, some extension of the Lois Weedon principle, local selection of seed as is adopted already with such staples as jowári, and improvement of the cultivation of the crop which must be the outcome of full enquiry and appreciation of the existing methods, followed up by the cautious application, where found feasible, of scientific principles.

But meanwhile there are means at hand which are capable of extending the export demand of wheat. The chief of these is the improvement of the method of preparing the crop for the market, at the same time with precaution that such improvement shall not play into the hands of dishonest middlemen. Improvement in this direction must be protected against the tricks of the trade. Else no real advancement of the welfare of the country, nor of the just extension of the trade, can be permanent. The trade must be subservient to the interests of the people, and not the interests of the people to the trade.

Steam wheat-thresher.

67. I have consistently urged that the most effectual method of improving the export of wheat is to introduce steam machinery. My endeavours to induce a large firm to enter into the trial have been successful. A full description of the trials has been published in the 1st number of the *Indian Agricultural Gazette*. The results may here be briefly summed up.

The wheat is thoroughly cleaned, and bad and under-sized grains eliminated. The straw is delivered unbroken, but separated from the awns and husks. It was found that on the assumption that full work for the whole year can be found for the engine, and work for six months in threshing wheat and other crops for the thresher, wheat can be threshed, winnowed, dressed and bagged ready for export at a charge of 1 anna per maund of 80 lbs. This charge provides for European supervision and the use of coal as fuel. If two or three machines could work in one locality, and if the rayats could spare part (say $\frac{1}{2}$) of the straw for fuel, the charge could be lowered. This charge is further based on the supposition that the machine is worked for hire.

The minimum cost of threshing, or rather treading out, and winnowing by hand in the native method is 3 annas per maund, and nearly as much again is incurred at the port of shipment in dressing and re-bagging, which operations include much tampering with the produce.

The deficiency of the machine in the eye of the rayat is that the straw is not broken up, but perhaps requires partial re-treading to fit it as cattle fodder. Many other objections were raised. Most were very hollow, but it must be admitted that the machine did not find favour. Not one man willingly gave his wheat to be threshed, even though the price offered for the steam-cleaned wheat was very remunerative.

A straw-bruiser will remedy the defect if defect it is, but this will add to the cost; and it is a question whether the separation of the awns of the bearded wheats of the country, which contain no nutrition, does not leave the straw in a

more suitable condition for fodder than when broken up with the awns in the treading process.

68. The advantages of the machine have been fully discussed, and it only behoves me here to indicate what further action has been decided on.

Government Resolution No. 7803 dated 25th September 1885.

Government have withheld sanction to the purchase of a smaller engine and thresher with a straw-bruiser, but have offered to bear half the expense of another trial this season, with the promise that, if it is fairly successful, a smaller complete machine will be purchased for the Bhadgaon Farm.

The innovation is, no doubt, a great one, but not greater than the supersession of hand by steam machines in dealing with cotton. Success will be secured if only the legitimate value of the cleaned wheat can be obtained.

Collection of samples of the wheats of the Presidency.

69. Samples of each important variety of wheat from each district of the Presidency where the crop is grown, have been collected and are preserved in my office. The Chamber of Commerce nominated a representative Committee of gentlemen of the leading firms in Bombay most largely interested in the wheat trade to pass its verdict on each sample. The opinion of the Committee as to the value of the wheats of the various districts has been printed in full, and is a very valuable record.

Trade.

70. I append a statement showing the course of the trade during the last five years, and for the eight months of the present year. A comparison will show that the depression noticed last year was only temporary. As far as can be judged, the coming season will be very favourable for wheat all over the Presidency, and this with a deficiency of the American crop may go far to establish the Indian wheat trade on a firm basis. I believe that there are good grounds for hoping that when the Indian wheat is better known it will be better appreciated. A good season here coming at the same time as deficient crops elsewhere will go far to give Indian wheat the chance it wants.

71. **Tobacco.**—Encouraged by the favourable opinions received from the leading firms of Europe, Government sanctioned a grant of Rs. 2,500 for a further experiment in tobacco-curing at Nadiád in the Kaira District. The experiment was conducted by Mr. Bechardás Vehárídás Desái in consultation with the Collector and in communication with me. The services of Mr. Jöns, who was employed last year as curer, were also secured. The whole credit of obtaining Mr. Jöns' assistance must be accorded to Mr. Bechardás. The curing shed of the previous year was unsatisfactory, and so the Collector's bungalow at Nadiád was converted into a drying room. Curing did not begin until the setting in of the monsoon, for want of sufficient moisture. The process took about three months. The final report on the subject has not yet been received; but the curing, in the Collector's opinion, was done in a much more systematic way than last year, and the tobacco looked light enough. Samples of cured leaf, in boxes of five pounds each, have been recently sent for further opinion to the leading firms of England and Ireland whose opinions were received last year, and also, by the kind offices of His Excellency the Governor, to well-established firms in Holland and to the Austro-Hungarian and Italian Consuls.

In order to test its actual worth in the European market, arrangement has been made to send to England five bales of the cured leaf, each of 250 pounds, to be sold there through a firm of brokers. The price thus fetched will be a more valuable guide than the mere opinion of experts in developing the Nadiád industry. The Desái purchased at his own cost a tobacco-cutting and cigarette-making machine from Bombay. With the help of this machine, smoking tobacco and cigarettes have been manufactured for sale in India. The question whether manufacturing can be profitably carried on is thus being tested. I am rather inclined to think that attention should be confined to improvement in the growth and curing for the foreign market. But Mr. Bechardás is not unwise to seek to ascertain how far local manufacture can be made to pay.

The tobacco cured this season is entirely of the indigenous Nadiád variety, but a considerable quantity of Virginian seed has been obtained and sown. Mr. Jöns did not arrive in time to apply his experience to an improved method of growth of the plant. Next year the value of his experience will be put to the test, and tobacco of both Nadiád and Virginian seed will be cured.

Besides the experiment made by the Desái for Government, this enterprizing gentleman has cured a large quantity of tobacco on his own account with Mr. Jöns' assistance. For the curing an extensive closed drying shed was constructed. It will thus be seen that Mr. Bechardás has in no way relaxed his efforts to secure success for the tobacco enterprize. Further, he has enlisted the co-operation of the Junágad Darbár in Káthiáwár. His elder brother Mr. Haridás Veháridás is Diván of the State. Under Mr. Jöns' superintendence a large area of tobacco has been sown at Junágad, and arrangements for curing the crop are in progress.

The attention paid to the improvement of tobacco on the Experimental Farms has already been noticed.

72. **Cryptostegia grandiflora.**—As noticed in the last year's Report, (para. 49), Mr. Woodrow instituted experiments with the knife and receiving tins procured from Ceylon on isolated trees to test the question whether the collection of the sap for preparation of India rubber would be likely to pay the Forest Department.

In September one old and vigorous plant, and 10 others between one and five years old, growing in soils varying from stony to rich river-side alluvion, were selected for experiment. Vertical cuts one foot in length were made with the caoutchouc collecting knife, which makes a V-shaped section in the bark and subjacent tissue. The collecting pan was fixed at the lower end of the cut. Fresh cuts were made 10 times at intervals of 3 days. The highest quantity of dry caoutchouc obtained from one plant was 10 grammes, and from one cut 4 grammes. Many of the cuts yielded so little sap that the collecting pan received nothing at all. The most vigorous plant appeared exhausted after the 5th cut.

Mr. Woodrow estimates that with the plants fairly plentiful a labourer could not make the cuts and fix the pans and collect the sap more than 200 times daily. This would yield roughly 100 grammes worth not more than 4 annas.

In Government Resolution No. 1023 dated 3rd February 1885 the reports of the Conservators of Forests were reviewed. In two districts the plantations were doing fairly well. In others the seed failed to germinate owing probably to mismanagement. Colonel McRae, the Conservator N. C., gave his opinion that the cost of collecting the sap would be too great to make a plantation commercially successful. This corroborates former conclusions, and now Mr. Woodrow's experiments seem to make it as certain that the collection of the sap from isolated trees, which are to be found in every garden in India and which grow wild on the Western Gháts, would scarcely pay even under favourable conditions.

(b).—Exotic.

73. **Cotton.**—The Dhárwár experiment, referred to in detail in my report last year, has presumably been carried out on the lines indicated. I have, however, failed to obtain any account of its success or otherwise. But during my tour in Dhárwár at the commencement of the year I paid particular attention to the various points connected with that experiment, and also to the other questions which bear on the improvement of cotton in Dhárwár.

(1) Dhárwár Experiment.

74. I propose first to narrate shortly the details of the experiment with selected seed instituted by the Commissioner S. D. with the advice of Dr. Forbes Watson. In 1882 some picked seed from 5-lobed bolls was sown in *one field* in each of the tálukás of Bankápur, Hubli and Gadag. The outturn in Hubli (Bengeri village) was very good; but Mr. De Silva, the Inspector of Cotton-gins who con-

ducted the experiment, states that in the produce the number of 5-lobed bolls was not greater than in the surrounding fields not sown with selected seed.

Another object of the experiment was to demonstrate the advisability of exchange of seed. The whole quantity of seed (332 lbs.) from Hubli was sent to the Bankápur táluka, and sown in the fertile well-farmed villages of Ingalgi and Budihal.

The crop at Gadag was poor, but 67 lbs. of seed were sent to the Hubli táluka and sown. The produce of the 5-lobed seed sown in the Bankápur táluka was very poor. The land was badly farmed and the seed was rejected for further sowing.

Besides the produce of the two fields above noticed, two tons of seed were collected, picked and distributed. In only one táluka were all the prizes awarded (last year's Report, para. 36). I ascertained by enquiry that the prizemen were rayats of Ingalgi and Budihal, and that these sowed the good seed raised at Bengeri in Hubli.

In 1884 seven tons of seed were collected from the fields sown with the distributed seed, that from one táluka being sent to another.

75. Looking at the whole matter I hardly think that results commensurate with the expense have been or can be secured. As long as the distribution was small in amount, it was possible to watch and record results; when it reached larger dimensions, the supervision and possibility of watching and recording results decreased proportionately, and with increase of distribution an equivalent decrease in care in selection must follow. If the first small experiment of 1883 had been conspicuously successful, it might be argued safe to extend the distribution on the same principle largely without attempting again to record results. But the first distribution was only very partially successful. It neither demonstrated the advantage of using the produce of 5-lobed bolls for seed, nor that of exchanging seed from one táluka to another; and certainly the numerous cotton-growers whom I saw and questioned, showed no anxiety to adopt the principles which it was sought to inculcate. It remains to be seen whether the Collector can in his review of the experiment show that a greater measure of success was obtained than I think likely or possible.

(2) Egyptian Cotton.

76. Concurrently with the distribution of selected seed an attempt to test the value of the black-seeded Egyptian cotton was made. In 1883 2¼ tons of seed were imported from Egypt. The whole crop was brought up and ginned partly with the saw-gin and partly with the steam-roller gin. Only 6 tons of seed were secured. An attempt to distribute this seed, without any promise of purchasing the crop, was made. Great reluctance was exhibited. My conviction, gained after much enquiry, is that the cotton is quite unsuited to the district. It grows well, but does not ripen seed. I find also that the Egyptian cotton was tried in 1832, 1857 and 1860. Each trial resulted in failure. At one time it was thought that earlier sowing would secure success. This plan did not succeed. I think there are grounds for desisting from further trial with this variety.

(3) Saw-gins.

77. One of the most important questions in Dhárwár is with respect to the saw-gin. A reference to the Gazetteer* will show the various steps which led to the introduction of this necessary concomitant of the American cotton which has established itself in the district, and the reasons why the management of the saw-gin factories still remains in the hand of Government. Three years ago it was discussed whether Government could not safely retire from the direct manufacture, distribution and repair of the gins; but it was resolved to await the advent of the railway, when it might reasonably be expected that steam saw-gins would be set up by private firms. The railway is opened, but there is no indication yet of any such enterprize. There are steam gins at Hubli and Gadag, but the roller pattern is used.

* Dhárwár Statistical Account, Vol. XXII., pp. 366-373.

78. I sought to ascertain whether the people could not now be left to themselves to arrange for the repair of their gins. There is a great deal of discontent among them. The factories are made self-supporting from a subscription of Rs. 6 per annum per gin from each owner. The tax may be evaded by the deposit of the saws and spindles at one of the factories. The owners are entitled to the services of trained hands on payment, over and above the general subscription, for wages and material. The complaint is that the trained workmen kept are too few, and that only those villagers who live close to the factory get any benefit. On the other hand, more labourers would entail a larger subscription, and apparently the people are not careful to have their gins repaired in the slack season, but wait till the ginning time comes, and then, finding something go wrong, all clamour for the factory men. At Hubli and Ingalgi the rayats assert that they can make their own arrangements, provided Government will assist them in procuring new saws and certain working parts and new gins when required; but every where else there was a consensus of opinion that Government must keep up the factories, and I believe this is a necessity. It can only be hoped that private steam saw-ginning factories may yet be started.

79. There is one gin worked by bullock power at Halyál near Hubli. At Devgiri I saw another being set up. There is a third, now not used, also near Hubli, and at Ingalgi there is a prospect of another. This utilization of bullock power must be encouraged. It will reduce the labour now falling on the factory workmen, for the rayat who works a gin with bullocks is in a position to employ his own skilled hand. It may be advisable to seek to introduce Gordon & Co.'s bullock power into this district (see para. 72 of my last year's Report). This machine has no place to fill in Khándesh, but there may be benefit in Dhárwár.

80. A new pattern of saw-gin has lately been introduced into Dhárwár. It is a great improvement; but the people, I think naturally, complain that the improved grid might have been adapted to the old frame work and other working parts, instead of necessitating their purchasing an entirely new gin. They do not like the new grid. It is too good, and cleans the cotton too well to suit the degenerated demands of the trade. The larger outturn of the old grid is solely due to the large percentage of seed carried through. The same feeling shows itself also in respect to the foot-roller. This rude implement worked by women can compete and does compete successfully with the steam-rollers, because the trade is not particular, and prefers buying cheaply half clean stuff to giving a remunerative price for well-cleaned cotton.

I may mention that the foot-roller—for indigenous cotton only—is the implement used all over the Southern Marátha Country, but that, strange to say, the hand *charak*, very similar to the Khándesh *charak*, is again found in the very south of the district.

(4) Want of Fresh Seed from America.

81. I noticed in my Report last year that there was a spontaneous demand for fresh seed in Bankápur of the white-seeded American variety, the only one of very numerous kinds which has really shown itself worthy of support. But I found that no further action had been taken. The seed has degenerated. It is harder and smaller than it was. Though a good year seems to check this degeneracy, there is, no doubt, need for new importation. The demand for new seed is not confined to Dhárwár. From Kolhápur I have received a large indent. I have placed myself in communication with the Chamber of Commerce, and fresh seed will be imported.

But I have decided on adopting a slightly different plan from that followed heretofore. Fresh seed is very expensive. It never does well the first year. I propose therefore to sow the seed in that part of the district (*e. g.* Bankápur) where the variety succeeds best, (I may notice that in the deep black-soil tálukás of Ron and Navalgund it gives a poor crop in comparison with the yield of the lighter black districts of Bankápur, Karajgi and Ránebennur) and to distribute the produce at a moderate charge. This plan I shall recommend to the Kolhápur State. Specific proposals will be made to Government for sanction to hire land for one year for the purpose.

(5) Cotton Market.

82. The Acting Commissioner Mr. Moore (last year's Report, para. 36), induced the Hubli Municipality to decide to establish a cotton market, and some prospect of a market at Gadag, (now an important junction,) was entertained. Nothing has been done. I discussed the matter with the leading traders and rayats of Hubli. The system of middlemen, which is very strongly established, militates against any such open dealing. The brokers have it all their own way; and it would be a positive disadvantage, if not ruin, to them if a cotton market were established, which would secure to the producer the benefit of competition among the buyers. On the other hand, it behoves the District authorities not to let the matter drop. An open market is greatly needed, and would alone effect much improvement to the prospects of good cotton.

(6) Prospects of American Cotton.

83. The valuable staple acclimatized from American seed is well established. Its cultivation is liable to fluctuations with the rise and fall of the demand for good stapled cotton, but it will not disappear. Its hold is especially strong on the three tálukás named in para. 81 above, and the large areas of the surrounding Native States. It does not do well in the deep black-soil tálukás. Its advantages are :—

1. That it can be put into the market sooner. It ripens earlier.

2. Its outturn becomes sooner certain, and advances can therefore be earlier secured on the crop.

3. Cleaned by the saw-gin it economizes manual labour, and this at the time when this labour is in great demand.

4. In good years its yield is very high.

5. Though more liable to blight than the indigenous variety, it possesses greater power of recovery.

The question of introducing this variety into neighbouring districts—*e. g.* Bijápur—is very important, but with its introduction the saw-gin difficulty must be met. In Bijápur this year experimental cultivation has been re-commenced, and saw-gins to gin the crop have been procured. The experiment is being carried out by the Assistant District Inspector, Agricultural Department, under the orders of the Collector. Its results must be awaited. If success is secured, its extension will be sought.

(7) Khándesh Cotton.

84. In reviewing the results of the distribution in 1883 of selected seed in Dhárwár, Government asked whether this method of offering rewards for good samples of cotton could not with advantage be extended to Khándesh and other districts. This reference has led to a very complete discussion of the position and prospects of cotton in Khándesh—the district next to Dhárwár where the largest expenditure has been incurred by Government to improve cotton, and where at the present time nevertheless the largest need for improvement exists.

Government Resolution No. 8507 dated 28th October 1884.

85. The subject of adulteration is of such importance that I feel it my duty here to state carefully the whole case before Government, for only a full statement can explain the final deliberate decision that practically nothing at all can be done.

86. The Secretary of State forwarded a communication received from the Liverpool Chamber of Commerce calling attention to the increased adulteration of East India cotton—a subject of very great gravity—a growing evil which seriously imperils the foremost staple of India, at the same time affecting and disturbing most grievously the cotton trade. In due course the opinion of the Bombay Cotton Trade Association was solicited. This body informed Government that their attention had already been directed to the matter in such a way that they had been induced to appoint a special

See Government Resolution No. 8066 dated 13th October 1884.

Committee to consider the question of mixing and adulteration in all its bear ings. The conclusion arrived at was then announced—

"Having thoroughly considered previous legislative enactments on cotton frauds, and the discussions connected therewith, by the light of more recent experience, and having further before them the resolutions come to by the Liverpool Chamber of Commerce, they had nevertheless come to the conclusion that special legislation was not advisable."

The Association then formulated its advice to Government, *viz.:*—

(1.) That Government should discourage the growing practice of ginning different growths together, thus producing a mixed and deteriorated seed.

(2.) That Government should point out to the cultivators the benefit of persevering with the cultivation of the finer descriptions of the staple.

(3.) And that Government should aid them in procuring improved seed for that purpose.

With this advice it was suggested that the action initiated by Mr. A. T. Crawford, Commissioner S. D., in Dhárwár was a step in the right direction, and might be imitated in other districts with advantage.

The proceedings of the meeting held to consider the report of the special Committee were at the same time forwarded to Government.

87. The Chairman premised his remarks by stating that some of the members of the special Committee after perusal of the pamphlet issued by the Liverpool Chamber had entered on their deliberations with strong views in favour of special legislation, but that when the effect on the trade caused by the late Cotton Frauds Act was discussed, and when the manner in which the trade has been conducted since the withdrawal of special legislation was considered, the feeling became universal that further legislation was not advisable.

It was admitted that "a certain amount of admixture" had become prevalent since the abolition of the Cotton Frauds Act, and that this admixture was a decided evil, hurtful to the trade, and a source of loss to merchants. (It could not be expected that this meeting should concern themselves with the effect of admixture on the producers. That was not their province).

88. The Chairman gave his opinion that mixing had during the past season been of a less consistent character, and that professional mixers had not been so successful. He charged the native dealers with the origination of the plan of mixing, turning thereby their special knowledge of cotton to account. Mixed bales passed muster, and they became bolder. But the growth of the practice soon brought matters to a crisis, and a set of rules was formulated to combat the evil. The penalty clauses were, however, soon found unworkable. Contracts were made by the native dealers *inter se* with the omission of these clauses, and the European merchants were compelled to make them optional. But even with this relaxation of the stand taken against mixing, the Chairman thought that an improvement had set in.

89. The deliberations of the Committee were then described as to the form which legislation, if decided on, should take. Fatal objections appeared to arise against every suggested penal provision. In fine, it seemed clear that a mild Act would be unworkable, and that any other form of legislation would entail a completely equipped staff of Inspectors, armed with extensive powers, which would simply be the re-institution of the Cotton Frauds Department with all the features detrimental to trade which had brought about its abolition. Therefore it was decided to ask Government for aid.

It was prominently—but no emphasis could be too strong—stated that deterioration of seed was the great evil to be feared, and the grievous fact was noticed that during the previous year large quantities of Dholera cotton had been brought into Broach, and ginned with the fine Broach *kapás*. This, of course, meant irremediable mixture of seed, which would surely show itself in the coming crop.

90. Next, the improvement effected by Mr. Ashburner, by substituting Hinghangháti seed for the indigenous growth of the Khándesh District, was referred

to, and it was admitted that, *during the time in which the evil of admixture had risen and thriven*, the deterioration of Khándesh cotton had gone on. The deduction was justly drawn, that it was this admixture by the trade which fostered the deterioration,—in other words, which fostered the cultivation of the short-stapled Varádi.

91. The Chairman in proposing the form of letter in which the assistance of Government should be invoked, inserted a clause to the following effect—that it had been found from actual experience impossible, owing to the constitution of their own body, to establish and adhere to a set of trade rules which would effectually put a stop to the practice of mixing.

This clause was omitted by a majority, on the ground that the Association was quite strong enough to make a rigid set of rules, which, if loyally adhered to, would go a long way to putting an end to the system of mixing.

92. It remains to be seen whether this much-desired result can be effected by the Association. If the trade can and will stop the mixing, then Government's decision to do nothing at all will be fully justified. If, on the other hand, the trade cannot or will not stop mixing, it will, in my humble opinion, be incumbent on Government to seek to stop it without permitting interference with the trade or the obstruction caused by inspectors, to weigh against the demands of the country and the welfare of the rayat. But I am anticipating.

93. The Collector of Khándesh, Mr. W. H. Propert, was the first to lay before Government his estimate of the practicability of the advice offered by the Association.

He pointed out that no effort had been relaxed by the Revenue officers—(1) to prevent the extension of Varádi, for he had oftentimes gone near overstepping the bounds of legal authority to check its spread; (2) to encourage the cultivation of improved varieties, for at the Máheji Exhibition handsome prizes had been yearly awarded for the best samples of exotic cotton; and (3) to supply good seed, for the Government Farm had for its main object the production and distribution of as much good seed as possible, but that in 1882 the rayats got out of hand for two reasons. First, they had become fully aware that no restraining authority remained in the hands of the Collector, and, secondly, the price given for Varádi had reached or nearly reached that accorded by the trade to the better staples of the Dhárwári (acclimatized American) and Hinghangháti.

He showed that the producer has very little voice in the question as to what crop should be sown. He gets his seed from the middleman, and his crop is virtually disposed of, seed and all, before it is grown.

He admitted that the rayat prefers to grow the indigenous variety, which is reared with far more ease, and yields a heavier crop. When the demand rose for this commodity, it was very easy indeed for the middleman to extend its growth at will. And he asserted forcibly that if for one season (1883) the merchants had refused to buy Varádi, or had at any time within the past three or four years assisted him in his efforts to sustain the good name of Khándesh cotton, the Varádi cotton would have been virtually stamped out.

94. Next, turning to the question of the distribution of good seed, he indicated his reluctance to look again to the Berárs, because there was evidence that the system of admixture had worked harm there as well as in Khándesh, and there was little prospect of advantage from the re-importation of this Hinghangháti variety, which is not so valuable or generally suitable as the Dhárwári. And so with regard to Dhárwár; the fact of Mr. Crawford's movement to improve the cotton of that district shows that the staple has deteriorated there also. Therefore there is risk in applying for seed thence. But Mr. Propert argued that in Khándesh itself it is possible to collect a large quantity of good seed by separately picking the bolls of the exotic cotton grown in and among the indigenous crop, relying on the fact that the former ripens earlier than the latter.

95. I may parenthetically remark that good cotton can be procured from Dhárwár. Experience has shown that seed acclimatized there succeeds better in Khándesh than freshly imported seed; and though the Dhárwár seed has deteriorated, its transfer to Khándesh will almost certainly give fair results.

The plan, recommended by Mr. Propert of collecting seed in Khándesh, too, is feasible. But, as is clearly argued, there is no possibility, under present adverse circumstances, of getting good seed sown. By the kind offices of one of the leading merchants in Bombay I was informed that his up-country agents could not, if they would, at present induce cultivators to sow the exotic cotton. Perhaps this opinion should be received with caution; for, as all the reports tend to show, the rayat is not the arbiter in this matter.

96. Mr. Propert sums up with his advice that dishonest mixing should be made penal. He holds out the alternative that the Bombay merchants for one year should refuse to buy the mixed cotton. But the reply to this is that the merchants cannot afford to consider any such scheme.

97. The Commissioner Mr. E. P. Robertson—after, I think very wisely, insisting that the coercive measures adopted by Mr. Ashburner some years ago were altogether over-estimated as regards their good results—says that Government have no right to interfere by dictating to the people what cotton they should sow, but fully supports the demand for a law to punish adulteration—very pertinently remarking that the merchants can hardly plead for the re-imposition of the law which their vehement opposition caused to be abolished, however much they may be convinced that that law is wanted.

98. Independently I represented my view of the question. The object of my letter was to show that the advice of the Cotton Trade Association is futile, based on a misconception of the position of the rayat. I tried also to give reasons why the method of improvement initiated by Mr. Crawford in Dhárwár would do no good in Khándesh. I called attention to the late discussions in the Berárs, and to the late Mr. Ridsdale's able review of the whole matter, in which he showed that interference with the rayat is not justifiable on either administrative or economic grounds. This review was called forth by the resolution of a meeting that the action of Mr. Ashburner in 1873 had secured wonderful results in Khándesh, but had been detrimental to the Berárs, in that it caused an influx into that Province of the seed of the short-stapled variety ousted from Khándesh (which in the Berárs is called Khándeshi, and which in Khándesh is called Berári or Varádi), thereby working much harm, and that the imitation of the policy of Mr. Ashburner would rehabilitate the cotton of the Province. The Government of India, Revenue and Agricultural Department, prevented any action being taken by the plain statement of the plain fact that Mr. Ashburner's policy in Khándesh had not secured lasting results. I endeavoured to make it clear that though the Dhárwári cotton does well in some parts and some soils in Khándesh, it is not suitable to others—that it would be an evil to attempt to stamp out Varádi (or Khándeshi cotton), inasmuch as that variety is the only paying one in its peculiar soils. Further, that the production of Varádi has its recognized and justifiable value, though the cotton is useless for export, except for purposes of admixture.

99. I ventured to suggest that the earnest desire of the Cotton Trade Association to evolve a workable method of preventing fraudulent admixture, and the no less earnest anxiety of the District officers to assist in the movement would be best fostered by the appointment of a Joint Commission of merchants and Revenue officers to enquire into and discuss the whole matter. On the one hand the merchants would see how unworkable the advice offered by them really is, and, on the other hand, the Revenue officers would learn much as to the most feasible method of meeting the evil without disturbance of the trade.

With well-sifted information on the various points noticed, the Commission, I thought, would be in a position to recommend a feasible working plan. The merchants would then be entitled to call on District officers for co-operation, and the District officers would know what support they could expect from the trade. At present in their eyes, in spite of the enlightened and well-intentioned declarations and warnings of the organized mercantile associations, the trade is doing every thing it can to checkmate their efforts at every step.

I casually hinted at the feasibility of establishing warehouses near the ginning and pressing factories, where cotton received should be sorted and

cleaned. I need only say that this plan is universally declared to be unpractical, and I do not wish to pretend that I am able to elaborate a scheme in connection with it.

100. All these papers were considered by the Chamber of Commerce and the Cotton Trade Association. They were practically a challenge to the trade, and the trade could not take up the challenge. The former body explicitly stated that the admixture is due to a demand in Europe for inferior stuff.

> "So long as there exists a demand in the consuming market of Europe for the inferior descriptions of cotton, so long will merchants continue to purchase, middlemen to mix, and growers to cultivate it. No good end could be served by attempting to interfere with the natural course of the trade."

The Chamber went on to urge that there are signs of a re-action against mixed cotton, and advised Government to take energetic steps to distribute good seed throughout the districts, presumably to be ready to meet an improved demand.

The Cotton Trade Association in disposing of the reference contended that there are buyers in Europe of adulterated and mixed stuff on its merits, and that merchants are bound to deal in it. It is therefore presumable that much of the adulteration which now goes on is not fraudulent. Certainly the former proceedings of the Association gave me, at any rate, a different idea of the matter. It seems to me to be merely removing the fraud one stage further on, for these buyers in Europe of adulterated and mixed stuff on its merits, paying the high price they do for the chief ingredient (worthless on *its* merits) of the mixture, cannot be credited with honest dealing.

Resolution 4953 dated 17th June 1885.

101. The orders of Government were that no steps to stop the supply of a commodity which is grown to meet a demand by consumers can be taken. As regards the latest advice of the Chamber, it was pointed out that, till the improved demand for good cotton does arise, it would be premature to distribute good seed.

It must be drawn from these orders that Government do not approve of any legislation to check fraudulent mixing.

The course of events must be watched; but whatever is done in the matter must be done without consultation with the trade. It is, in my humble opinion, hardly fair to ask the merchants to show how the rayats can be protected from by-injury resulting from the course of the trade. On the other hand, the perusal of the deliberations of the Cotton Trade Association gives the fullest confidence that whatever can be done on their part will be done.

102. The Commissioner N.D., Mr. G. F. Sheppard, brought to the notice of Government a specific instance of the importation into Broach of 179 tons of Dholera cotton to be ginned. It may be presumed that this was for the purposes of admixture. Clean cotton cannot be successfully mixed. Mr. Sheppard also noticed that annually a very inferior variety of cotton is exported to Dhollera from the Kaira District. He enlarged on the greater danger from deterioration of the seed than from mere admixture of staples, and urged that the subject demands consideration in the interests, *not* of the trader, but of Government itself.

He contended further that it is easier to prevent admixture of seed at the beginning, than to restore the high character which a crop has once lost. He advised that the Collectors of Broach, Surat and Ahmadabad should be directed to watch importations of inferior "Kapás", and authorized to buy up the seed either pure or mixed. There can be no objection to such a plan. The seed would be useful for cattle food and the loss nothing, because it may be presumed that a lot of seed, stigmatized as mixed, would not knowingly be used for sowing. I trust that the Commissioner will carry his suggestion into practice.

103. Mr. Stormont of the Bhadgaon Farm made a short tour chiefly to ascertain the extent of admixture *in the field*. The following may be quoted from his report:—

"29. *Tour in Cotton Districts.*—About the beginning of February the Collector directed me to make a short tour in the eastern tálukás with the object mainly of finding out to what extent mixed cotton seed was sown by the cultivators; also whether, as alleged, merchants were paying preference prices for the short-stapled Varádi. My inspection embraced a circle of districts including Páchora, Bhusával, Sávda, Chopda and Erandol. The results of the analysis of numerous samples are arranged in the margin.

TABLE VI.—ANALYSIS OF COTTON.

Place.	Average Mixture.		
	Varádi.	Hinghan-ghâti.	American.
	Per Cent.	Per Cent.	Per Cent.
Páchora	25	30	45
Yával	58	40	6
Arrawad	70	30	...
Chopda	75	25	...
Dharangaon	50	20	30
Erandol	58	29	13

"30. A glance at the table will show that the crop of Khándesh still contains a fair percentage of good cotton. At Páchora it is nearly half American; the short-staple being only a quarter of the whole. This is admittedly due to the spare farm seed being annually sold in the neighbourhood. At Bhusával no reliable sample was obtainable, but about Yával the American element diminishes to 6 per cent.; at Arrawad and onward to Chopda it altogether disappears, until the vicinity of Dharangaon is reached, where with the Hinganghâti it makes up half the crop. Coming southward by Erandol the Varádi again predominates, being just outside the circle under the influence of the farm.

"31. *Opinion of Cotton Merchants.*—At Dharangaon a number of merchants and others met me to discuss the question of cotton improvement. The smaller class of local dealers were strongly opposed to any measures of restraint, declaring that although the price of Varádi was comparatively low, still the cultivators liked to sow a certain mixture, it being the more reliable poor man's crop.

"32. The Bombay buyers, on the other hand, were unanimous in opinion that only the operation of an Act could ever restore the reputation of Khándesh cotton and the consequent prosperity which its producers enjoyed for so many years. All, however, were agreed as to the beneficial results which must necessarily follow the distribution of large quantities of good seed."

104. It seems to me that Mr. Stormont has missed one point, deducible from his enquiry,—that is, that the further he went from the railway and from cotton centres (*e. g.* Dharangaon) the less the percentage of good staple. This fact would seem to show that the suitability of the indigenous variety, apart from the support accorded by the demand for admixture, has a strong bearing on the increase of Varádi. The deduction may be wrong, but if it is correct, it is a warning that a place for this variety must be recognized as necessary (see para. 98 above).

(8).—Nankin Cotton.

105. **Nankin Cotton.**—About the end of June 1884 the Government of India supplied 10 maunds of seed to test the suitability of the Nankin or *Kháki* coloured cotton for the summer clothing of the troops, in place of the dyed cloth. A guarantee was given that the produce would be purchased at 4 annas per lb. of clean cotton.

The results of the distribution were as follows:—

Haidarabad Farm.—The experimental plot was close to a plot of Sindi cotton—both irrigated and similarly treated. The outturn of the former was 478 lbs. of seed cotton valued at Rs. 26, while that of the latter was 1,238 lbs. worth Rs. 68. The lint and seed were in the proportion of 1 to 3 by weight. Mr. Strachan suspects this cotton to be a sport and not a true variety.

Bhadgaon Farm.—Two fields were sown, one in June and the other a month later. The outturn was 34 lbs. and 24 lbs. of clean cotton per acre respectively. The proportion of lint to seed was as 27 to 73, which in Mr. Stormont's opinion is a low proportion.

Kaira.—Here the seed was distributed to the farmers through the Desái of Nadiád. The season was very unfavourable. Very heavy rains washed the plants out of the ground. Only in about half an acre belonging to the Desái, the plants survived, but the yield was miserable—only 2 lbs. of clean cotton.

Ahmadnagar.—The absence of rain made dry-crop cotton impossible. Though the seed was distributed to several who were anxious to experiment, only one pound was actually sown, and that on the High School Farm under irrigation. The seed was sown alongside plots of acclimatized New Orleans cotton. Both received similar treatment, save that the latter was sown a fortnight earlier. The Nankin yielded 80lbs and the New Orleans 280 lbs. of seed cotton per acre.

Sholápur.—Here again rain was absent. 6 lbs. of seed were sown on 10th September under irrigation on the High School Farm. The seed germinated badly, and the plants all died under heavy rains of October.

Dhárwár.—The seed was distributed equally in 4 tálukás, 5 lbs. being given to each selected cultivator. The seed was good and germinated, but the season was most unfavourable from want of rain, and the crop was poor. The Collector remarks that the staple is strong but short, and adheres very firmly to the seed; the foot-roller will not clean it, and it is very doubtful whether the saw-gin is adapted for separating the lint from the seed, which, like that of indigenous cotton, is small, and will pass through between the grids of the saw-gin.

106. The cultivation of Nankin cotton in this Presidency has not got beyond the experimental stage, and even experimental cultivation is in its infancy. The only instance known of a farmer growing this cotton on his own account is in the Shevgaon Táluka of the Ahmadnagar District, where one Náráyan Raghunáth, a Bráhman holder of some means, cultivates it yearly as a garden crop to the extent of 5 gunthás. The seed is said to have been imported from Delhi about twelve years ago. The cultivator manufactures the produce into cloth for his own use.

107. My opinion of the trials was as follows :—

'On the whole, although the outturn under experiment was smaller than that of the local variety, it is not to be doubted that as large an area as may be desired can be grown with this cotton if the Government of India continues its offer of four annas per lb. of clean lint; but without such a stimulus it is not at all likely to be grown at all. I am very much averse to attempting to force this variety on the country. It may injure our staples by hybridization. Its seed may get mixed with the other varieties, and a most harmful, undesirable mixture will result, which once established will take long to remedy. No alacrity is shown by the Military Department to utilize the natural Kháki cotton in lieu of the dyed material, and it is not unlikely that a mordant may soon be discovered which will prevent the now unsatisfactory variations in the colour of dyed Kháki. Again, experiment has yet to be carried on to decide whether the colour of the Nankin cotton can be relied on. I have instituted experiments on this point at the Haidarabad Farm. The Nankin cotton has no merit as to staple or yield; and my advice on the matter, as it stands at present, is that all attempts to force its growth should be abandoned. I earnestly ask that pressure may not be brought to bear on me to do more than experiment with this variety.'

The following extract from a letter of the Chamber of Commerce—to whom a small sample of the Shevgaon cotton, which was decidedly superior to that grown on the Bhadgaon Farm, was sent—also supports my view :—

'The staple is short, irregular and wasty, and would be most unprofitable stuff to work. Under the circumstances the Committee would strongly advise that the cultivation of this description be confined to those places where it is indigenous, as there would be great danger of its hybridising with the local varieties to their detriment if introduced largely into this Presidency.'

108. **Jute.**—The experiment suggested in the last year's report is considered by the Superintendent of the Farm not likely to prove of any value. I shall, however, give further consideration to the matter.

109. **Manilla Hemp.**—I have not received any intimation of experiment on the lines indicated last year, but adhere to my opinion that the plant cannot compete with the common plantain. I would quote a Kánarese proverb—"*Báligidadolage giládde illa*"—*No part of the plantain tree is without its use.* This cannot be predicated of the *Musa textilis.*

110. **The Carob Tree.**—Further trials have been made, but with so little success that experiments have been discontinued. Both Conservators of Forests give their opinion that the tree will not pay further expenditure, and that there are many indigenous plants which better merit attention

Government Resolution No. 7742 dated 25th September 1885.

in the matter of encouraging trees which will produce fodder in time of drought. It does not seem necessary to detail the list of failures, but some facts collected at the Bhadgaon Farm deserve record. The plantation contains 125 well-established trees, but these are occasionally watered. Many are 20 feet high. The best yield from one tree was 1,140 pods, weighing dry 28 lbs. Compared with some locust beans bought in an English shop, the pods were less developed, but nearly as sweet. To test the power of the tree to withstand drought irrigation was withheld. One tree died, but others did not apparently suffer. The fruit was, however, deficient in saccharine matter, and inferior to that of irrigated intercultivated trees. Watering was re-commenced in May to save the plantation.

111. **The Rain Tree** *(Pithecolobium saman).*—Experimental cultivation was commenced in 1880 in the hope that this would prove to be a valuable road-side tree. I have kept a record of the various trials since that date, which will be useful, should the tree come in again for favour in high quarters. Suffice it to record here that the best that can be said of it is that in irrigated land of fair garden quality the tree shows a rapid growth, but even in the most favoured situations it is a straggling plant with scant leaves and useless for shade. Some advocate further cultivation, but the decision arrived at is that further experiments may be left to those who desire to make them. Seed can be procured from established trees.

Government Resolution No. 4372 dated 30th May 1885,

112. **Manilla Tamarind** *(Inga dulcis).*—This tree was expected to prove of value as a road-side tree. It was first introduced into Bombay by Dr. (now Sir George) Birdwood. It showed wonderful rapidity of growth where a wet sub-soil or occasional irrigation was available. In 1883 it was sown in Násik. The Collector reported 'that the seed germinated well, and that the tree will serve as a good road-side tree as it grows luxuriantly and rapidly, particularly in light soil.' The Commissioner added—(1) the tree is well suited to the country; (2) its pods and leaves are valuable cattle food; (3) it is suitable for hedging land to be closed as forest; (4) there is a variety of the *Inga dulcis* indigenous to the country. I have not yet been able to identify this indigenous variety. In December 1884 parcels of seed were distributed over the Presidency. In reviewing the reports, Government directed the Collector of Násik to continue experiment with it as a road-side tree, and ruled that, if other District officers so desire, they may make trials at their discretion.

113. The **Divi Divi Tree** has also secured successful results, and merits further extension. I have noticed it in para. 45 above.

114. **Arrowroot** has in two places during the year been prepared from *Maranta arundinacea.* Mr. Woodrow of the College of Science obtained 8 lbs. of pure starch from the produce of 200 square feet of ground (94lbs. of roots, weighed freshly dug=9 tons per acre), and a native gentleman, Mr. Náráyan Gogte at Dápoli in Ratnágiri, who has been experimenting for five years, prepared 350 lbs. which on examination, both microscopic and chemical, proved to be fully equal to the pure Bermuda arrowroot. I have kept a record of the manner in which the plant was propagated, and the rhizomes converted into starch both by Mr. Woodrow and Mr. Gogte. The latter is in need of suitable appliances. Mr. Woodrow recommends a pulper, such as is used in England in preparing cattle food, to grind the roots, and a vowel-washer to wash the pulp. Mr. Gogte applied for the assistance of Government to secure a sale for the product of this new industry. A reference was made to the Commissariat Department. Government were informed that the requirements of this Department are yearly about 5,000 lbs., but it was intimated that the supply is obtained at an average rate of 4 annas 8 pies per lb., whereas Mr. Gogte cannot sell it cheaper than 12 annas, though with better appliances the cost will be much reduced. The price put on by the producer is very much less than what is demanded in the shops, and I am strongly inclined to think that the supplies obtained by the Commissariat Department are of arrowroot prepared from other plants than *Maranta.* If so, the Commissariat Department would, I think, do well to have their arrowroot analysed. I notice that the contract rates of the Commissariat vary from 1½annas

per lb. The fact appears conclusive that they are supplied with inferior arrowroot which can be very cheaply obtained from indigenous plants of the ginger tribe, *e.g.*, *Curcuma caulina*. This plant is abundant at Mahábaleshvar and other elevated localities. Dr. McConaghy in his account of Mahábaleshvar notices that the 'wild arrowroot' was for many years made for the Commissariat by Chinese ticket-of-leave prisoners. 'Judging from the market value, five to six pounds to the rupee, it is very inferior to West Indian arrowroot. In 1878 an European resident prepared it at a cost of 5½ lbs. for the rupee. The colour and taste were pronounced good, but it was found deficient in nutritive properties, and the owner was obliged in the end to sell it at 8 lbs. the rupee.'

The Commissariat Department contract for arrowroot to supply the hospitals, and this being so, the use of an inferior substitute of a substance of such limited demand seems to me unjustifiable, and, therefore, Mr. Gogte deserves more encouragement than he has received.

When the papers connected with Mr. Gogte's application for support were published, an attempt was made to show that I was incorrect in styling the Mahábaleshvar arrowroot, wild arrowroot. It was further asserted (*Times of India*, 22nd July 1885,) that the arrowroot was introduced from Ratnágiri to Mahábaleshvar. Dr. Lisboa, the well-known botanist, replied to the newspaper article, and showed that the writer to the *Times* was in error. I borrowed the term "wild arrowroot" from Dr. McConaghy, but it is a correct one, as that starch was prepared from a wild plant. The *Curcuma caulina* is not found in Ratnágiri.

115. As regards the Bastard Cedar (Guazuma tomentosa), I have no fresh information to record. Experiments with the Golden Plantain and Italian Turnips have already been noticed above (para. 45). Arabian Date Palms have been grown with fair success at the Bhadgaon Farm, but the climate is uncongenial. The measure of success secured is adequate to justify the decision made, that as soon as suckers are available, they will be tried in Surat or other district where the common date palm thrives.

116. As regards **Maize**, the trials at the Bhadgaon Farm have been detailed above (para. 45). But in the Panch Maháls District, where maize is a staple, trials have been made since 1883 with seed from America without success. There seems reason to believe that circumstances in each case, irrespective of the seed, partly explained the want of success. Further trial may hereafter come up for consideration.

E.—Forecasts of Cotton and Wheat.

Government of India's circular No. 89 A. dated 25th July 1884, and Government Resolution No. 7298 dated 12th September 1884, Revenue Department.

117. Forecasts of cotton and wheat prepared from such information as could be obtained from the overworked Revenue Establishment were submitted to the Government of India. A printed circular letter embodying the orders of Government and fixing the dates for the submission of the reports was issued to the District officers with the approval of the Divisional Commissioners. The reports received from the Collectors and Political Officers were, in many cases, unpunctual and meagre, and no information was received from the Baroda State, the lands of which are extensively cultivated with both the crops.

The Baroda Government have, however, kindly promised to make special arrangements to supply full and timely information this year.

118. Telegraphic messages were, from time to time, sent to the Government of India, showing—

(1.) The area under cultivation as ascertained on the earliest date, with the causes of increase and decrease;

(2.) The effect of the weather on, and the condition of, the crop; and

(3.) The nature of the harvest, prices, and the course of trade.

119. The year's results may be thus briefly summarized:—

A.—Cotton.

120. The area under cotton was:—

British Districts.	1884-85.	Average of previous 5 years.
	Acres.	Acres.
Sind	63,674	55,185
Gujarát	534,381	527,848
Deccan	898,610	910,669
Karnátak	760,405	778,142
Total ...	2,257,070	2,271,844
Native States (excluding Baroda)	2,116,004	.....
Grand Total ...	4,373,074	2,271,844

Sind.—Very little cotton is grown, except in Haidarabad where the area was 47,000 acres. Though in Karáchi the late rainfall was excessive and injurious, and in Haidarabad there was a blight, the crop on the whole flourished, and yielded a return varying from 7½ to 14 annas.

Gujara't.—The chief cotton-producing districts are Broach (225,534), Ahmadabad (204,730) and Káthiáwár (1,711,515). The area was above the average except in Ahmadabad, but was below that of the last year except in Káthiáwár. This decrease was due to excessive and long continued rainfall. The crop was good in parts of Káthiáwár, but in other districts it was much damaged by excessive rain. In Broach the crop was put in late. The crop was a 5-anna one in Ahmadabad and an 8-anna one in Broach.

Deccan.—The chief cotton district is Khándesh (853,575). Except in that district the area was far below the average. This decrease was owing to deficiency and in some cases to the total absence of early rain and also to anticipated repetition of experience of last year, when the crop was damaged by late heavy rains. This experience was realized in Násik and Khándesh. In Khándesh there was much damage from shedding during cloudy weather. The crop was 7 annas in Khándesh, 3 annas in Ahmadnagar and Sholápur, 6 annas in Násik, and 1 anna in Poona.

Karna'tak.—This tract comprises three of the best cotton districts in the Presidency—Dhárwár with 385,068 acres, Bijápur with 270,820 acres, and Belgaum with 104,517 acres. The area was less than that of the last year and, except in Dhárwár, below the average. The decreased area was confined chiefly to black-soil districts where the early rains were scant or altogether absent. In Bijápur and in parts of Kolhápur the crop was a complete failure. Shedding during cloudy weather caused injury in places. In Belgaum and Dhárwár the crop was 7 annas.

Generally speaking the cotton crop of the Presidency during the year was far below the average in yield.

B.—Wheat.

121. The area under wheat was:—

British Districts.	1884-85.	Average of previous 5 years.
	Acres.	Acres.
Sind...	273,744	266,310
Gujarát	494,645	325,050
Deccan	914,865	791,811
Karnátak	669,187	290,839
Total ...	2,352,441	1,674,010
Native States (excluding Baroda)	344,157	.....
Grand Total ...	2,696,598	1,674,010

Sind.—Except in Thar and Párkar, the area was above the last five years' average and above that of the preceding year. Shikárpur (161,046 acres) is the best wheat-producing district. The crop was much benefited by the rainfall in December, though in some parts it was affected by rust. The yield varied from 12 to 14 annas.

Gujará't.—The area was above the average and that of the preceding year in all the districts. The increase in area was due to favourable rainfall. Land sown with kharif crops and cotton, which were injured by the excessive rainfall, was re-sown with wheat. The chief wheat-growing districts are Ahmadabad (274,043) and Broach (119,238). The rainfall in November and December benefited the crop, which varied in yield from 8 annas in the Panch Maháls to 14 annas in Surat and Ahmadabad. In Broach the prospect of an excellent harvest was so marred by unfavourable weather in the latter part of the season that the yield was reduced to 9 annas.

Deccan.—The chief wheat districts are Násik (263,999), Khándesh (255,850) and Ahmadnagar (249,518). The area was above the average, but below that of the preceding year. This decrease was due partly to low prices of wheat and partly to more extensive rabi sowings last year through the fear of locusts. The crop at first suffered greatly from want of rain. The rain of November and December improved prospects considerably; but the gain was counterbalanced to a great extent by the prevalence of rust, which was general and in some places very severe. The late rains, too, had the effect of seriously deteriorating the quality of the outturn. Many samples which I have seen of hard white of the Deccan prove that it degenerated into a sample of little export value. Generally speaking, the Deccan crop was considerably below the average, and varied from 7½ annas in Khándesh to 1 anna in Poona.

Karná'tak.—This includes the rich districts of Dhárwár (399,809), Bijápur (161,571) and Belgaum (107,807). The area was above the average in all, but below that of the preceding year in Bijápur. The increase was due to sowing wheat on land left unsown owing to want of early rain, and was most conspicuous in the black soil plains, where wheat is a large crop. The crop did not give a fair return, as it was sown too late and in uncongenial soils. In the north half of Bijápur, where the rain was most unfavourable all the year round, the crop was a complete failure.

Generally speaking, the crop of the year was good in Sind and Gujarát, and was poor in the Deccan and Kánarese districts.

122. As regards the outturn, the information available is yet very incomplete and untrustworthy. A set of formulæ for the calculation of the outturn has lately been prepared and sanctioned by Government. As the anna valuation for each táluka required for purposes of calculation was not shown in the district returns, it is not advisable to attempt an estimate.

123. The wheats of the Presidency that are received in Bombay for export are the hard white varieties from Násik, Ahmadnagar and Khándesh for the markets in South Europe, the sóft red from Ahmadabad and the neighbouring districts, and the soft kinds (red and white) from Sind for the English markets. In the absence of trustworthy trade statistics it is not possible to ascertain how much of these wheats was received in Bombay from these districts for export to Europe. The hard white wheat received in Bombay from the Deccan during the last season (March—June) was much less than usual owing to unfavourable season. The produce was locally consumed, partly because the outturn was only enough to meet the local demand intensified in some places by the deficiency of other food crops, jowári and bájri, and partly because owing to rust the grain was unfit for export. Some of the samples of hard wheats of the Kánarese districts have been pronounced by the Chamber of Commerce very suitable for export, and these wheats will add considerably to the total trade for the Presidency on the completion of the Southern Marátha Railway.

124. The year's forecast reports were, on the whole, meagre and unsatisfactory. Owing to the fact that District officers were on tour at the date of the reports, most were received through the stationary Huzúr Deputy Collectors, who, because they are stationary, could add no remarks explanatory of the returns. The valuable opinions of the Collectors and their Assistants, gained independently during their tours, were thereby conspicuous by their absence. To secure uniformity and punctuality, and to avoid chances of error and misunderstanding in the preparation of the forecasts, simple returns asking for information on those points only on which details can be obtained without entailing extra labour on the establishment, were prepared with instructions regarding the manner in which they are to be made out, and circulated to the District officers with the approval of the Divisional Commissioners. In the British districts it has been arranged

that the Mámlatdárs should, to save time, send printed returns, duly filled in, direct to the Director of Agriculture, forwarding at the same time a copy of the return to the Collector of the district through the Assistant Collector in charge of the táluka, in order to enable that officer to write his remarks and opinions. The Assistant Collector will send his remarks to the Collector, forwarding a copy of the same direct to the Director of Agriculture. The Collector will favour the Director with his opinion. Thus the opinions of the District officers will, as a rule, reach the Director of Agriculture in proper time.

125. It is hoped that the new arrangements will give better results. In their letter No. 102 A—6-155, dated 14th July 1885, the Government of India desired to be furnished with forecast details regarding oil-seeds on the plan laid down for cotton and wheat. But it will not be wise to extend the forecasts to oil-seeds and other crops of export value till a higher standard of correctness has been attained with respect to wheat and cotton, and till the Circle Inspector staff has been extended. When that staff is spread over the Presidency, it will be possible to imitate the American plan of compiling progress details, with regard to the most important crops, from the reports of the Inspectors placed for this purpose in direct communication with this office, and to telegraph periodically the general statements desired by the Government of India. The plan prevailing in the North-West Provinces, of selecting private individuals in each district or táluka to make report of the progress of crops, is not suited to a rayatvári system.

F.—Agricultural and Cattle Shows.

126. The Agricultural Department has not yet been able to take up the question of establishing shows, but has sought to encourage spontaneous efforts in different localities.

127. It is well known that Lieut.-Colonel Nutt, now Acting Political Agent in Káthiáwár, has popularized shows of cattle and agricultural produce in Gujarát. The show at Gondal in Káthiáwár in December 1883 was the 7th agricultural meeting which has taken place under Lieut.-Colonel Nutt's management, and its success was very marked. The Nadiád Agricultural Association has followed suit.

128. In the Deccan, the Ahmadnagar Horse and Cattle Show has established itself as an annual institution, and under good management has gained success. In Poona, last year, an Agricultural Show was held for the first time independently of the Horse Show. The Máheji Show (in Khándesh) which as a Fair flourished for many years before 1833, when it was taken under Government management, has been temporarily suspended. This Exhibition combined the characteristics of a Horse and Cattle Show, a show of Agricultural Produce, and a Fair for the exhibition and sale of various articles of local manufacture. The chief cause of the decrease in popularity of this Exhibition, no doubt, was the opening of the railway. Traders found it more profitable to exhibit their wares in Bombay and other trade centres than at the once well-attended Máheji Fair. In sanctioning the discontinuance of the Show, Government directed me to keep in view the desirability of renewing the Cattle Show and Agricultural Exhibition at a more suitable centre of the district, when the condition of the Agricultural Department may permit of its undertaking the management of such Shows and Exhibitions.

Government Resolution No. 6509 dated 13th August 1884.

129. In the Southern Marátha Country a most successful enlargement of an old annual fair at Chinchli near Kolhápur was organized by the Kolhápur State in 1883. Annual shows (Horses, Cattle and Agricultural Produce) have been established. In the Dhárwár District at Karvati on the Tungbhadra there is a cattle fair yearly held, and close by in the Bellári District of Madras is the Mairál Fair. This latter I visited in February. The bad season in all black-soil districts, however, seriously affected its success. There were numerous cattle, but not of high quality as they usually are. But it is at these fairs that the agriculturists make their yearly purchases of iron for agricultural implements, sickles, bill-hooks and the like.

130. It is thus evident that spontaneous efforts are made all over the country in the improvement and enlargement of Agricultural Shows, and the time will, I trust, soon arrive when the Agricultural Department will be able to take a more definite share in their encouragement.

131. The Royal Agricultural Society of England adopts the plan of supradding its funds and support, each year, to a well-established local show. By its prizes and by the attraction which it offers to the exhibition of new inventions, the "Royal" show is very largely attended. The visitation thus accorded to a local show gives it an impetus and support which cannot be overrated. The Agricultural Department cannot do better than imitate the example of the Royal Agricultural Society. If Government will sanction a considerable sum to be utilized in prizes for cattle, awards for improved implements and machinery, it will be possible for me to organize a Provincial Show yearly. The show should be the substitute, year by year, of one of the local shows. It should be held one year in Gujarát, the next in the Deccan, and the third in the Southern Marátha Country. At such a show it will be possible to invite implement-makers in Europe and America, as well as in all parts of India, to exhibit their improvements. It will be also possible to invite the officers of the Agricultural Departments of other Presidencies and Provinces, who cannot come to a local show, and the show would certainly be attended by those interested in agriculture both in the Presidency and beyond it. The opportunity could be utilized to discuss agricultural improvement in all its bearings. It would be the duty of my Department to record results, as is done by the Royal Agricultural Society. I have here enlarged on this subject, in order that I may invite criticism on the proposal, and thus gradually bring it into shape for a definite request for support to the Government.

132. In November 1884 I attended the Ahmadnagar Show. To the funds Government contributed Rs. 500 and Local Funds Rs. 300. The expenditure in prizes amounted to Rs. 1,856. I served as one of the judges of cattle. In December 1884 I took part in the organization of the first Cattle and Agricultural Show at Poona. Cattle were heretofore brought in small numbers to the Horse Show held in September, but were an unappreciated supplement. The time of year in which the Horse Show is held is unsuitable for cattle. The funds were thus secured :—Government contribution Rs. 500 ; Local Funds 500. The rest came from subscriptions spontaneously offered. The amount awarded in prizes was—for cattle Rs. 700; agricultural field produce 300; garden 140; essays 125 ; total 1,265.

The essays were invited on the following heads :—

	Rs.
1. Rotation of crops	50
2. Potato cultivation in the Poona District	25
3. Manures available in India	25
4. Wheat cultivation in Bombay	25

Some of the essays were really good, and the best have been printed in part by the Committee and in part by the Editor of the *Shetkari*.

The show is not to be held this year, because Government can give no support, and it is a question whether the show should not be biennial.

133. I visited the Nadiád Show in March, and acted again as Cattle Judge and Judge of Agricultural Produce. The funds received no addition from Government grant, which was not solicited, but were supplied by the Nadiád Association, aided by subscriptions. Several Chiefs contributed. The sum of Rs. 1,040 was distributed in prizes. The Nawáb of Junágad, it may be noticed, sent about a dozen *patels* or village headmen at his own expense with an officer to show them the exhibits.

134. I was unable to visit the Chinchli Show, though I received a cordial invitation from the Regent of Kolhápur, as I was at the time present at the Mairál Show.

G.—Manufacture of Sugar.

(1).—Sugar Refinery at Poona.

135. A sugar factory was established in 1883 near Poona by a Pársi gentleman, Mr. Ádarji Dorábji Ghásvála. At the Poona Show of 1884 excellent samples of sugar were exhibited. But the enterprize, which I consider from an agricultural point of view to be of the highest importance, is languishing, simply because the necessary by-product—rum—cannot be disposed of. The sale of rum is only possible through the licensees for the sale of imported liquor, and necessarily it comes into competition with Mauritius rum, cheap brandies, and the like. That in the long run this rum will establish itself, cannot be doubted. It has done so in other parts of India where sugar refineries have long existed, but here a taste for it must gradually arise. If the rum cannot be disposed of the factory will fail. Mr. Ádarji has lately, in a well-argued and moderate petition, placed his case before Government. He asks for permission to open retail shops to sell the rum. Whether such permission can be granted without infringement of the monopoly already accorded to licensees of imported liquor is not a question for my department, but it is my duty to record my sympathy with the enterprize, provided the manufacture of sugar be maintained as the main object of the factory. The cultivation of sugarcane has so extended that the price now obtained for *gúr* is almost prohibitively low. It may fall further still, and sugarcane will not be grown with profit.

With a brisk manufacture of sugar, a large extension of cane cultivation is certain under the Khadakvásla Canal which runs close by the factory. Further, it will be in the interest of the manufacturer to seek to improve the cultivation of the crop.

(2).—Sugar from Toddy.

136. *Surat.*—The subject of a second attempt to introduce the manufacture of sugar from the date-palm has received full attention. The former trial was made in 1874 and 1875 at Surat under Mr. T. C. Hope, the Collector. The success of this manufacture at Jessore induced the attempt. I carefully studied the records of the first trial, which, on the whole, was unsuccessful. Mr. Hope came to the conclusion that no reasonable prospect could be entertained of success unless irrigable plantations of trees set close together, to reduce the cost of tapping to a minimum, were made, and that Government must set the example. Government while expressing willingness to exempt trees utilized for sugar manufacture from the tree-tax, under conditions which would prevent any danger to the excise revenue, directed me to ascertain whether any private person would undertake an experiment in making a plantation with irrigation on these terms.

I visited Surat to inspect the trees belonging to a gentleman who, owing to the increased rate of tree-tax, found the tapping for liquor unprofitable, and who was ready to place his plantation at my disposal for experiment. But the irregularity of growth and the long neglect from which some of the trees had suffered, forced me to decline the offer.

From Thána also offers were received, but these all proved unacceptable. I am not, therefore, able to secure a proper conduct of further experiment by the aid of private persons.

I must notice that the Honorable Mr. Khanderáv Ráste gave attention to the subject. He obtained sanction, unknown to me, to prosecute experiments. The experiment was not made in the light afforded by the old Surat trials, and proved a failure. It is just possible that Mr. Ráste may make further endeavour; but, if he does, he should first thoroughly acquaint himself with the facts elicited in Surat, and then should visit Jessore, as I have had the opportunity of suggesting to him.

I fear that till the A'bkári Commission has submitted its report, and till orders thereon have been passed by Government, the owners of date-palms and other palms capable of producing sugar will not listen to overtures for private experiment.

(3).—Sugar from Sorghum.

137. The commencement of experiment under this head has been narrated in my remarks on the Bhadgaon Farm.

(4).—Native Manufacture of Sugar.

138. Coarse sugar is manufactured in Kolhápur and in parts of the Belgaum District. A short, but careful, description of this rude process was given by Mr. W. S. Price, Assistant Settlement Officer, in the 4th number of the *Indian Agricultural Gazette.*

The process is clearly susceptible of very radical improvement. It will be seen whether the Cook's evaporator, which will be tried at the Bhadgaon Farm, will show itself worthy of use for cane sugar.

H.—CHEMICAL MANURE.

139. Mr. S. Cooke, Professor of Chemistry, &c., at the College of Science, has taken out a patent for the preparation of a highly concentrated chemical manure. The raw materials are ashes, lime, and ground bones. The product is a light, very friable, pumice-like substance, containing various phosphates of lime, especially the bicalcic phosphate, carbonate and silicate of potash, and carbonates of magnesia and lime, &c. These compounds exist in the manure in forms readily soluble, and therefore assimilable by the plant. The manure is, therefore, a quick-acting one. It is in a form in which it can be easily drilled in with the seed, or used as a top dressing. It is perfectly inodorous and easily transportable. The ingredients are all obtainable in the country. The manure is stated in the specification to be a general manure. But it is properly speaking a special manure, inasmuch as it does not supply one of the most important constituents of plant food—*i.e.* nitrogen; but this ingredient can be superadded by the use of poudrette, or green manures, or simply by the addition of purely nitrogenous or ammoniacal manure. The invention seems to point out a most valuable method of utilizing—

(1) the vegetable refuse of large cities, *e.g.* Bombay; and (2) bones.

The increasing export of bones has necessarily attracted great attention from those interested in the agricultural welfare of the country. Lieut.Colonel Nutt in 1883 brought this export to the notice of Government, and asked for legislation to put a stop to it. The decision of Government* was that legislation was inadvisable, and Government approved of my view of the matter, that the stoppage of the export should be effected by the creation of a counter-demand, which would very soon make the export unprofitable. It is with interest, therefore, that I view Professor Cooke's invention. If it meets with support, the export of bones will cease immediately.

*Government Resolution No. 8365 dated 15th November 1883.

140. It behoves me to state that the process demands, first, the *burning* of refuse vegetable matter to obtain the potash, and the *grinding* of bones to make the chemical action speedy and complete. Where bones and vegetable matter and lime can be obtained on the spot, it would hardly pay to convert them into a concentrated manure. Rather would it be better to treat the ground with the ingredients separately, and leave it to form them into the required compounds. This, however, would be a slow process, and the manure would then not be a quick-acting one. Bones, especially if not ground, require years to decompose. I consider the invention a valuable one, and especially worthy of the attention of the Municipal Corporation of Bombay; but before other uses can be expected of the invention than the convenient and profitable disposal of city sweepings, it has to be shown distinctly what the manurial value of the substance is as compared with the value of the same quantity of potash and phosphate of lime otherwise procurable in the cheapest form. The proportions in which the ingredients are present in the manure will have to be guaranteed by any company which takes up the invention before it can be purchased and the price will vary according to the proportions found by chemical analysis. The process is simple, and in every way unobjectionable from a sanitary point of view. A company, if formed, would, of course, import machinery to grind the bones.

141. Indirectly this manure has been suggested as a substitute for ráb. I intend to try it during the experiments which will be made in the coming season; but, without anticipating results unfairly, I may note that I have no hope of success in the matter. The suggestion was made under a misappreciation of the functions of ráb.

I.—Ensilage and Fodder.

142. In my last report I fully described the steps taken up to date in the experimental introduction of ensilage, and the construction of the silos for the experiments of which the results have now to be recorded. When the large masonry silo was opened out it was evident that at least 300 lbs. per square foot of weight had been given instead of 200 lbs. as was estimated. Further, it must be noticed that a very heavy fall of rain in October caused the mass to sink nearly a foot below the top of the silo, and lower than was expected.

143. The silo was opened on the 17th April 1885 in the presence of a Committee composed of the Executive Commissariat Officer, the Officer Commanding the Mountain Battery at Poona, the Depôt Transport Officer, and the Inspecting Veterinary Surgeon, with Lieutenant-Colonel Warter, R. H. A., as President. A considerable number of gentlemen, European and Native, were also present.

144. I stated in my last report that the chief object of making an experiment in Poona—which is not a neighbourhood where a deficiency of fodder in the hot season is often experienced—was to enlist the co-operation of the Commissariat Department in the endeavour to test the value of ensilage, and to introduce the practice if found profitable.

145. There are many *kurans* or grass lands in the charge of the Commissariat Department which are now managed by contractors under condition of their supplying grass to the Department. If ensilage is worth anything at all, its first adaptation will be to such *kurans*. The first growth of grass will be cut and stored in silos, and the aftermath, cut after the rains are done, for dry grass or else grazed: a double crop will thus be secured. The silaged crop may be kept for years, and may be specially utilized as a reserve to be used when sudden and unforeseen demands for grass and fodder are made on the Commissariat Department, as was lately the case when the Soudan force had to indent on Bombay. Without such a reserve the price of fodder rises without any check. I do not believe that exhaustion of grass lands would follow under the management suggested, for the seeding of the aftermath would be sufficient. If not, it would be easy to sow grass seeds. It was also an object to enlist the co-operation of the Forest Department—to whose management the majority of the grass lands of the Presidency is entrusted. The silo was made in one of the forest *kurans*.

146. The action of Government in the Military Department, at the instance of Captain B. L. Reilly, Executive Commissariat Officer, in nominating a representative Committee was, therefore, an important support to the aims which were before me.

147. It is found that the ensilaged grass was in excellent condition. It was very moist, and there was a peculiar smell which stamped it—to use the nomenclature of ensilage—as sour, not sweet silage. Around the edges, to a varying depth of 3 or 4 feet, the stuff had gone bad. This loss is admitted to be inevitable; and the measure of success is not the total absence of loss, but the smallness of the percentage. The top layers were, however, good away from the edges of the pit. A smell was given off, but this is characteristic of sour ensilage, and though unpleasant to man the smell is not disliked by cattle.

148. The colour of the grass was well preserved. Sheaf after sheaf was taken out which could hardly be distinguished from fresh cut green wet grass. To obtain the best results from ensilage it should be used quite fresh. But the distance of the silo from the Commissariat and other animals, which were supplied, induced the officers to dry it. I took out two bundles and dried them carefully under shelter. They very speedily lost all peculiarity of smell, and looked like good well-made hay. At any rate, this grass must, even dried, be superior to dried grass. Drying under cover is only better than drying in the sun, in that the green colour is preserved.

149. The exact percentage of loss cannot be stated. I put 76½ tons of green grass into the pit, and I issued 72 tons of moist ensilage to the Commissariat Department and the battery at Kirkee. Besides this, small quantities were given to various gentlemen who were desirous of trying it. Certainly there must have been less than 4 tons thrown away as bad, even if no allowance is made for shrinkage in the pit. The loss by dryage was by experiment proved to be 60 per cent. Meadow grass in blossom contains about 70 per cent. of water, but when made into hay the product contains only 14 per cent.

150. The Committee individually recorded their opinions on the ensilage—some of them after short experiment with various animals.

The President reported that "on opening the silo, and taking off the matting covering, the outside grass was found of a very dark colour, and had a strong odour; but that only a small portion of the ensilage was of this description—the mass of it in the middle being of a greenish brown colour, and having less odour." After feeding some artillery horses Colonel Warter stated as follows :—

> "I am of opinion that the ensilage should be dried in a shady place before being given to horses. It then loses its strong odour in a great measure, and smells like hay stacked before it is dry. Horses will eat it well when used to it, and it is probably as good as the hay as stacked in this Presidency, but not equal to shrub grass."

Captain Keene, Commanding the Mountain Battery, said :—

> "From the short trial made with the mules of this battery I am of opinion that grass can be preserved by ensilage in a manner to afford good forage for mules, &c. I believe in this particular silo the grass was not quite sufficiently pressed, and I think that the grass was not of the best quality originally." [1]

Captain MacMahon, Depôt Transport Officer, said :—

> "From the six days' trial of the grass taken from the silo I am of opinion that it affords perfectly nutritious forage for ponies, mules, bullocks, and elephants. They undoubtedly prefer it when dry, and when it has lost some of its disagreeable smell. They then eat it very readily. In its wet state they only partake of it in the absence of other food."

Mr. Steel, Inspecting Veterinary Surgeon, examined the grass taken from the silo and

> "found that it had undergone no change calculated to be prejudicial to the health of animals consuming it."

Captain Reilly, Executive Commissariat Officer, issued ensilage mixed with karbi to 50 slaughter cattle and 100 sheep :—

> "The cattle eat the ensilage quite readily, and there appears to be no doubt that this description of food is both wholesome and agreeable to these animals. The sheep did not take to it, at first eating it in small quantities only, and evidently preferring the karbi."

151. The silo had no shed, and the monsoon was near. I therefore asked the Commissariat Department to take over the balance in bulk. Government (Government Resolution No. 2757, Military Department, dated 11th May 1885) accorded sanction :—"All possible support should be given to the Director of Agriculture in this matter of ensilage, and it should be freely used by all Government animals in Poona and Kirkee." The ensilage was, therefore, made over to the Executive Commissariat Officer. The final opinion formed was unfavourable, for in Government Resolution No. 3828 dated 10th July 1885 (Military Department) the conclusion arrived at was—

> "It is the usual practice in this Presidency to cut and stack grass shortly after the termination of the rainy season, and where this can be done there would not appear to be any advantage in making and storing ensilage."

152. I need not say that I cannot subscribe to this conclusion, nor, if I may say so, do I consider it warranted by the facts of this year and the careful reports of the Executive Commissariat Officer last year. It is not a particular but a general condemnation of ensilage, and this, in the face of the great attention paid to the subject in India and out of it, I humbly think to be premature. The only figured statement of results which I have been favoured with, is that

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[1] This is incorrect The pressure was ample, and the grass of the best quality

describing a trial with 6 horses—4 on 25 lbs. each of ensilage in lieu of all other fodder, and 2 on 20 lbs. each of the ordinary dried grass supplied by contractors.

The experiment began on the 22nd May, but two of the horses had been fed on ensilage in lieu of grass since the 18th April. The first weighment was made on the 22nd May. Later weighments were taken on the 2nd, 9th and 19th June. The two horses referred to lost during the interval 31 and 42 lbs. respectively. One of the others on ensilage neither gained nor lost a pound. The 4th lost 14 lbs.

As to the 2 horses on dried grass, one lost 8 and the other 28 lbs. Later on (7th July) it was reported that the horses were losing condition. Two had been 81 days and two 49 days on the ensilage.

153. I cannot claim that this experiment was very favourable, but I must draw attention to one fact which appears to me to account for the ill-success. The ensilage was given out in bulk to the Commissariat Department at the end of May. It was kept in a shed in a heap. It was neither dried carefully before distribution, nor was it given fresh from the silo. It was allowed in its moist condition, out of the silo, to go on fermenting and deteriorating. I am not surprized at the result.

154. Before the receipt of the Government Resolution referred to, I had ascertained generally the opinion, unfavourable to ensilage, which the members of the Committee had formed, and I asked Government to appoint a Commission to report on the subject and to advise as regards future action, after taking the opinions of the various officers who had made and witnessed experiments. This was considered unnecessary, and I was directed to report fully, discussing the merits of ensilage, and stating the results of experiments made.

155. In my last year's report and in this section I have, therefore, fully discussed the subject. I have not been able to make another experiment this year, because I found too late that the grass of the Bámbhurda *Kuran*, where the silo is, was already sold; and it was not worth while trying to make arrangements with the purchaser for the grass required.

Moreover, I am greatly disappointed that my attempts so far, though as successful as could have been expected, have completely failed to secure sympathy from the Military authorities.[1]

156. It remains for me to notice the two silos made by Mr. Woodrow.

The murum silo has been opened. The ensilage had during the last two months (before the date of Mr. Woodrow's report) been fed regularly to the farm bullocks. "The cattle get as much as they will eat, and I find this runs about 25 lbs. per head daily. This with the usual ration of 3 lbs. per head of grain has kept them in good condition under hard work. The ensilage has a very strong smell, and the cattle do not appear particularly fond of it."

The black-soil silo has not yet been opened. Mr. Woodrow wishes to see what the stuff will be like after having stood through the whole monsoon succeeding the monsoon in which it was pitted.

157. Silos have been made at the Bhadgaon and Haidarabad Farms and by the Collectors of Ahmadabad, Surat and the Panch Maháls. They have also been tried elsewhere, but I have not received reports.

Mr. Stormont tried to make sweet silage. The result was not satisfactory; but though the stuff had the appearance of half-rotten hay, the Farm cattle

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Government Resolution No. 5504 (Military Department) dated 21st October 1885.

Since writing the above I have received the financial statement of the Commissariat Department respecting the ensilage. The cost of ensilage used was Rs. 745. But this saved only Rs. 495 worth of ordinary fodder. The net extra cost was thus Rs. 250. I charged As. 8 per 100 lbs. of moist stuff, equivalent to Rs. 1-4-0 per 100 lbs. of well-dried ensilage, as this was the then ruling price of dry grass in the bázár, and I cannot allow that the dried ensilage was inferior to dried grass. It appears that the Commissariat Department only pay As. 14 per 100 lbs. of dry grass. If I had charged only that rate, the extra cost to the Commissariat would have been Rs. 65 only, and taking into account the value of the ensilage not accounted for in the Rs. 745, the net gain to me would have still been Rs. 150.

consumed it to the last leaf. Mr. Stormont with this experience is now making further trials.

Last year at the Haidarabad Farm Mr. Strachan's experiment was a failure, but this year has had much better success. Cattle ate the stuff freely. Mr. Strachan describes the smell as "quite new to him; not very unpleasant, but such as one would not be likely to forget." The silage seems, he says, to stand to green fodder somewhat in the same way that tinned vegetables represent the fresh thing just brought from the garden. I like this simile. No one can argue that ensilage is better than green grass, or that tinned vegetables are better than fresh; but where green vegetable cannot be obtained, the substitute is very acceptable.

The experiments at Ahmadabad and at Godhra (Panch Maháls) were both first attempts, and were not successful. That at Surat was more successful, for the stuff was readily eaten.

All the experiments made, except that at Bhámburda, were in field silos, *i.e.*, not air-tight and water-tight receptacles which the latest experiments in England and elsewhere demand as the only silos capable of making first-rate ensilage.

158. I do not intend to abandon experiments on ensilage. But I much feel the want of the assistance of an agricultural chemist. Without his aid it is very difficult to prove the superiority of good ensilage over dried grass cut after seeding; and without his aid it is very difficult for me to form a correct opinion myself as to the merits of the system.

METHODS OF PRESERVING FODDER ADOPTED BY THE AGRICULTURISTS.

159. An important enquiry under this head was set on foot by the Government of India. It was especially noticed that the enquiry was not directed in connection with ensilage, but it throws much light on the possibilities of ensilage. I made a full report with a summary of the district reports (*vide* my letter No. 568 dated 19th May 1885). The report will, it is presumed, be reviewed by the Government of India.

The enquiry disclosed the facts:—

First.—That there exists no custom of preserving grass or other fodder on any system resembling that of ensilage.

Secondly.—That hay is not made in Bombay. The grass is either cut green and fed to cattle, or it is left to seed, and is cut when fully matured after the monsoon rains are over.

Thirdly.—That there exists no practice of sowing grass seeds.

Fourthly.—That in many tracts there is great and sometimes chronic deficiency of even dry fodder in the hot season.

J.—IMPROVED AGRICULTURAL IMPLEMENTS.

160. I have referred to the steam-thresher under the wheat section. A machine used in parts of Gujarát has been brought to my notice by Mr. A'darji Jivanji, a retired Deputy Collector. It consists of a framework resting on 3 parallel rows of toothed wheels, and is used to thresh and cut up the straw of wheat. It is stated that it will with one man and a pair of bullocks thresh as much wheat as 15 pairs of bullocks would tread out. I have had one of the machines made up, and shall try it. Its cost is less than Rs. 50.

161. The manufacturer of the Poona 3-roller sugarcane mill, referred to in para. 70 of my last year's Report, has applied for a patent. The trial of the invention was made at the Poona Show. Two patterns of the Behia Mill were tried—the 2 and the 3-roller mills. The native wooden mill was also worked, in order that the extent of the improvement effected by the iron mills might be gauged. A full report was submitted, which was reviewed in Government Resolution No. 997 dated 2nd February 1885. The Behia Mills showed decided superiority. They are much more portable, much more easily and cheaply set up and worked than the Poona Mill, and extract as large a percentage of the juice as is desirable. The cost of the plant is less. For some time the patentees appeared to me to show reluctance to avail themselves of the favourable results of the comparative trial, but quite lately they have made arrangements to send mills to Bársi, Bhad-

gaon, Kolhápur, Chikodi, and Sátára—*i. e.* to tracts producing fine sugarcane. At the Poona Show Messrs. Massey & Co. of Madras exhibited some of their ploughs which are the result of the long and careful experiments on the defunct Saidápet Farm in the direction of adapting English and other foreign ploughs to the circumstances of the country. The cotton-soil plough has since been used by Mr. Woodrow on the College of Science Farm. "A very useful implement. Thirty acres have been broken up with it, and the ploughman has had the practice necessary to do the plough justice. It is as easy to manage as the native plough. The rear bullocks are not more distressed than the leaders, and the furrow is cut with a level bottom. With 3 pairs of oxen it breaks up a furrow 7″×9″, but the black soil still adheres to the mould board—a defect I hoped to get rid of after ploughing the first 10 acres, but have not yet succeeded. The other varieties of ploughs (Messrs. Massey & Co.'s and Mr. Stormont's new importation) I have not yet had the opportunity of trying at the work they are specially designed for."

Three of Massey's Swedish ploughs were purchased by rayats of the Ahmadnagar District. At Nevása two are regularly used for garden lands, but are considered unsuitable for black soil. The third was bought by a rayat of Puntámba. He does not like it, and cannot use it. I fancy he tried to do too much. I learnt at the Ahmadnagar Show, last year, that he found it difficult to manage; and Mr. Limaye, now Assistant District Inspector, Bijápur, went to show him how to plough. He does not appear to have profited by the instruction.

The Ratnágiri Local Fund Board has not favoured me with any opinion as to the implements purchased at their instance through me (*vide* Report of 1883-84, para. 71).

Mr. Stormont at Bhadgaon has regularly worked the plough made at Ipswich under his supervision, and approves of it.

Mr. Royal, Superintendent of the College of Science Workshop, is pressing his subsoiler and cleaning cultivator on the rayats of the neighbourhood.

An American scythe, with a blade of only 24 inches long and 4 inches broad, was successfully used by Mr. Woodrow to cut bájri. Four men, who had never used a scythe before, cut 2½ acres of green bájri in 11 hours.

Mr. Stormont has been authorized by me to purchase 6 dozen reaping hooks for use at the coming rabi harvest. The native hammered iron sickles are miserable implements, and the substitution of good reaping sickles appears feasible.

Dr. Cooke has just brought out, for the use of the College of Science Farm, several implements for experiment, among which I may name—

1, a bone-crusher,
2, a winnower,
3, a small threshing machine,
4, an improved chaff-cutter,
5, a cultivator,

all workable by bullock power.

162. I must complete this sketch with the notice of a fact which caused me regret. I found in Gadag (Dhárwár District) a very large unwieldy iron plough which a rayat was induced to purchase at Bellári for Rs. 75. It looks to me like one of the musters brought out to this country for adaptation. It was purchased from Mr. Sabapatti Mudliár, who has shown much energy in introducing improved ploughs, but I cannot understand how this gentleman could have recommended the unmodified old-fashioned European implement.

K.—The value of Ja'mbul (*Eugenia Jambolana*) in ridding tanks and wells of moss.

163. The unhealthiness of the densely wooded ghát tracts of the Kánara District is to some extent due to the badness of the water. One cause of pollution is the prevalence of a variety of moss. In 1883-84 an epidemic of fever of a severe type at Haliyál was attributed to the presence of moss in the drinking tanks. It is frequently cleared out by the Municipality, but always re-appears.

An observant officer, Mr. Krishnáji Ballál Deval, now Mámlatdár of Kumta, ascertained by enquiry that one of the tanks at Haliyál was twenty years ago surrounded by jámbul trees. These were cleared off to prevent the leaves and branches from falling into the tank. Old people said that the water used to be clear when there were jámbul trees. Mr. Deval further noticed a custom of placing jámbul planks or beams low down in the water in the side walls of wells to keep the water clear. With these hints, on his transfer to the Kumta táluka he made enquiry, and found that the people believed that jámbul logs possessed the property of keeping wells and tanks from moss. Accordingly he selected a new Local-Fund tank at the village of Bankikodla, which was full of moss, and placed several logs of jámbul in it. In two months the water was quite clear, and the moss had disappeared.

He next chose a large tank at Gokarn full of moss, so that the pilgrims found it difficult to bathe in it. Two hundred logs of jámbul were put into the tank, and the moss disappeared wherever there was a log. I have requested the Collector to direct the Mámlatdárs to make further experiment, and suggested that Mr. Deval should fill two large earthenware vessels with water and moss taken carefully from an infested tank, and that he should put some jámbul wood in one vessel, and not in the other, and watch the result.

I have asked for a specimen of the moss.

VI.—CATTLE-BREEDING AND VETERINARY ESTABLISHMENT.

164. I have not been able to make much progress in describing the various breeds of cattle. I have from time to time made notes on the various breeds that have come under my observation, and worked up the reports received from the District officers. But the information compiled up to date will not permit me to hazard yet any attempt at a full account of the breeds, and their merits and demerits.

Government Resolution No. 1066, dated 4th February 1885.

165. The subject of improving the breed of sheep has been taken up by the Commissariat Department. One recommendation was that improvement by crossing the Sind Dumba with the Deccan sheep should be sought. This cross has already been made successfully at the Bhadgaon Farm (*vide* para. 45 above). The plan of extending the improvement by giving rams of the new cross breed to shepherds in exchange for good ewes has not succeeded. The Commissary General laid much stress on the improvement of the breed of the meat-producing animals in not only the Deccan, but throughout the Presidency, because—

(1). The meat produced now is very inferior.

(2). The meat-eating population of India is increasing.

(3). The duties of an Executive Commissariat Officer in regard to the meat supply are yearly becoming more and more anxious.

He suggested as remedial measures—

(1). Strict attention as to the breed on the part of the owners.

(2). A rigid avoidance of the commingling of diseased animals with those in sound bodily condition.

(3). Better fodder, water, and as much green or ensilage fodder in the hot season as possible.

(4). A plentiful supply of salt at all times.

(5). Clean healthy pasturage.

(6). Interested attendants.

166. These principles are, no doubt, sound and indisputable, but it may be stated that the aim of the Commissariat Department is to improve beef, that of the Agricultural Department to improve the working power of the animal, and what is of primary importance in the one case is of secondary consideration in the other. For growing beef strict attention to breed is not advisable. Crosses are generally better beef-producers than pure-bred animals. Moreover, beef has never been the aim of native breeders, and none, therefore, of the pure breeds of this country are likely to give good results. Rather would I throw out a suggestion, that strict attention to crossing—say, English bulls with the country

cows—is required. The other principles above laid down are well known to the rayats in the abstract, and they try as much as possible to harmonize the practice with the theory. The violation of the principles is traceable to circumstances beyond their control, rather than to ignorance. The gradual success in ensilage will, it is hoped, provide a substitute for green fodder in the hot weather and early monsoon, which is a great desideratum almost everywhere; and the recent orders of Government will secure clean and healthy pasturage. It is hoped that some means in the interest of live stock may be discovered by which salt may be made palatable to cattle and at the same time unpalatable to man. If this discovery is made, Government will be able to make liberal concessions to rayats needing salt for their cattle, which in the interest of salt revenue cannot be asked for just now.

Resolution No. 7467, dated 15th September 1885.

167. Owing to financial pressure the establishment of the Veterinary Hospital as an appendage to the College of Science in Poona and of the Veterinary College and Hospital in Bombay have not made further progress. To encourage the work of these hospitals the establishment of Cattle-disease Inspectors on the Madras plan would be invaluable. There are many simple remedies for certain diseases which are unknown to the people. Foot-and-mouth disease, for instance, is easily cured, and its contagion easily prevented. If the Inspectors are properly taught and utilized, they will in some degree prevent the heavy losses sustained yearly by the people, and incidentally the improvement in breeding and management of cattle and sheep will receive care and will make a beginning. The only law at present in force in any part of India for the prevention of cattle-disease is Madras Act II. of 1866, and it is under contemplation whether similar legislative enactment cannot with advantage be introduced into the other parts of India.

VII.—AGRICULTURAL AND FISCAL STATISTICS.

168. The steps taken to revise the Forms of Agricultural Statistics are noticed above (paras. 19 and 20). The statistical returns required by the Government of India for submission to the Secretary of State will be compiled and forwarded as soon as the information is received from the District officers.

Rainfall Statistics.

169. The subject of recording correct and useful statistics relating to rainfall has been taken in hand. The figures given in Annual Reports and in Government Gazettes are not satisfactory and sufficient for purposes of correct analyses and deductions. As regards the character of the rainfall record it is not, as stated in my letter No. 962 dated 17th July 1885, sufficient to know what the weekly, monthly, or yearly total is. Information regarding the number of rainy days and of rainless days, heavy falls and their effects, and as to whether the rainfall was timely and sufficient, should be collected and compiled on an uniform system. I will illustrate this by quoting the evidence before the Famine Commission given by the Collector of Kaládgi :—

Information and evidence collected to answer the questions issued by the Famine Commission, 1878, page 12.

"The actual amount gauged is scarcely a criterion, because a heavy fall of a few hours may gauge much, but be of little good if it ceases entirely, whereas a gentle but continuous rain which does not gauge much may be most beneficial. For instance, the rainfall in June 1876 (6 inches 83 cents) is the highest recorded in the ten years preceding 1876, but yet that was the great year of famine. The rain in September 1877 (12 inches 3 cents) did infinite damage from its heaviness, whereas I cannot learn that that of September 1874 (22 inches 6 cents) did. Again, the fall of 1876 (13 inches 40 cents) resulted in severe famine, whereas the fall of 1871 (13 inches 92 cents) did not cause any bad effects."

170. I cannot lay too much stress on the necessity that exists for me to keep such a record of the rainfall as will show not only the amount in each district, but its effect. The evidence summarized by the Honorable Mr. Peile for the Famine Commission proves, if evidence is required to prove the point, that the effect of rain and weather at different times on different crops can only be ascertained by a close study of the rainfall at the several stages of the growth of various crops.

171. The Irrigation Department receives weekly returns from 230 gauges. The Chief Engineer has undertaken to place these at my disposal. Though ap-

parently numerous, the returns are incomplete, because none are received from some sub-divisions of districts. I have made an analysis of the rain of 1884 with the object of exhibiting the facts in a form which will be useful for reference, and more correctly indicating the features of the season, than the customary averages for whole districts now recorded in the Administration Reports.

172. I have for the purposes of this record divided the districts into the more and the less protected. The protected districts are those which have a regular rainfall, and are generally not liable to famine. These include the Gujarát and Konkan Collectorates with Kánara. The unprotected districts are those of the Deccan and Bombay Karnátak (excluding Kánara). These have a more or less irregular and scanty rainfall, and are consequently often liable to serious failures of crops.

173. In this report I have found it possible to make the digest of the rainfall only for the unprotected districts, but I have applied to Government for assistance in securing special returns for the tracts not covered by the reports submitted to the Irrigation Department, and propose in the report next year to include protected districts also.

174. Below the figures for each district I have added a few explanatory and descriptive notes. These will become more valuable as agricultural enquiry extends, and will be designed especially to show the effect of the arrival or absence of rain at particular seasons on particular staples.

175. The record will be a permanent one, and will, I believe, be an important guide to District officers when signs of distress appear. For from the facts of former years, well digested, it cannot be denied that the features of a new year, as they disclose themselves, can to some extent be correctly judged. If in any degree this record is valuable as a warning of future distress, or if it is of assistance in determining the extent of probable distress, my object will be secured.

176. It is possible that the analysis may more conveniently be thrown into the form of a chart or diagram, and to this point I will give attention.

177. With the aid of the Circle Inspectors, as will be noticed directly I have collected a number of current maxims on the rainfall of Dhárwár. I propose to comment on the rainfall of that district by the light of these proverbs, and it will be a further point for consideration whether the divisions of the rainy season customary among the people should not be adopted in my analyses as the principal divisions, rather than the English months.

178. As regards the rainfall of 1885 I intend to work up the analyses as early as possible with the descriptive notes, and to submit them to the District officers for scrutiny and criticism, so that when they appear in their final form in my report next year they will be deserving of full reliance as a correct statement of the facts of the season.

179. Before giving the tables I would describe the action I have taken with regard to proverbs on agricultural subjects. These are to a very large extent descriptive of the rainfall. I offered a prize to the Dhárwár Circle Inspectors for the best collection. The Agricultural Departments are under a strong injunction from the Supreme Government to make agricultural enquiry the primary object of their attention. The people have no text-book to guide them in their cultivation. Their practice is ruled by empirical knowledge supplemented and aided by the maxims which have been taught for generations by father to son. These contain the summed up experience of generations, and are one of the most fruitful subjects for study. They have a wide range. They deal with the effect of the rain at various seasons, the right time for sowing various crops, the relative qualities of various soils, and like matters, and they urge the necessity of good and careful cultivation.

180. I shall arrange the proverbs after a time in the form of a pamphlet with explanatory notes. I shall collect more in the Bijápur District, where the Inspector Staff has now been organized. These collections will in time be useful in preparing text-books on agriculture which are much needed, but which cannot yet be attempted. In an Appendix I give a few specimens.

VIII.—TRADE AND TRADE STATISTICS.

181. Except in the review made on the Rail-Borne and Road Traffic Report for 1884-85 the subject has not been taken up. The scheme of registering land traffic originated with the Secretary of State for India in 1874, who, in a subsequent despatch (No. 106 of 30th May 1878), laid stress on the collection and compilation of statistics of trade with foreign countries and Native States and along the chief routes, as the best means "of determining questions of great moment to the welfare of the people, such as the necessity of a line of railway, or the probable effect which the imposition or removal of a tax may have upon the trade." It was not found possible to meet the wishes of the Supreme Government till 1879, when on the report of a Committee—consisting of the Commissioners N. D. and C. D., the Commissioner of Customs, the Collector of Poona and the Collector of Salt Revenue—the Bombay Government decided that the Commissioner of Customs should undertake the duty of registering traffic passing across the external frontier of the Presidency, and that the Examiner of Guaranteed Railway Accounts should supervise the preparation of the returns of the Rail-borne Traffic. In 1881 the Commissioner of Customs issued the first report on the Rail-borne and Road Traffic under the orders of 1879. In 1883 the Government of India (letter No. 167 dated 27th September 1883) inquired whether "the supervision of traffic registration is one of the duties assigned to the Director of Agriculture." The Bombay Government answered in the negative (Government Resolution No. 8976 dated 6th December 1883), and stated that "the duty should not be imposed on the Director, whose attention is at present directed to many other matters falling within his province." The system introduced in 1881 continued in force until 1884, when the work of preparing reports and returns relating to Rail-borne and Land Traffic was for convenience transferred to the Examiner of Guaranteed Railway Accounts.

182. Most of the Collectors and Political Officers recommended the discontinuance of the registration of road traffic on the ground that it is carried on in an imperfect and untrustworthy manner (Government Resolution No. 9158 dated 18th November 1884), whereupon the Commissioner of Customs and the Director of Agriculture were asked to submit a scheme for the remodelling of the present registration posts on the plan adopted in the North-West Provinces, and to consider the expediency of transferring the supervision of the registration establishments to the Director of Agriculture. A joint report was submitted by the Examiner of Guaranteed Railway Accounts and the Director of Agriculture. They recommended—

(1.) That no change is advisable at present as regards the compilation or publication of either road or rail-borne trade statistics.

(2.) That when the Inspecting Staff of the Agricultural Department has been extended to all districts, the Director should be entrusted with the supervision and also the compilation of road trade statistics.

(3.) That meanwhile the registration clerks should be discharged, or else as far as possible collected into one division, to be there trained and formed into a movable staff as recommended by the Calcutta Conference.

(4.) That the question of transferring the compilation of the rail-borne traffic to the Agricultural Department should be indefinitely postponed, the returns and reports being, however, submitted through the Director of Agriculture, to give that officer an opportunity of commenting thereon.

183. These proposals, except No. 3, were approved (Government Resolution No. 2220, dated 16th March 1885). As regards the recommendation No. 3, Government decided that the existing arrangement on the subject of the registration of road traffic should not be disturbed. Under Government Resolution No. 2220 the report for 1884-85 was for the first time reviewed by me.

184. The chief features of the trade may be briefly noticed as follows :—

The total rail-borne trade of the Presidency, exclusive of Sind, amounted in 1884-85 to about 63 million maunds, of which more than half represents the trade of the Presidency with other provinces and the rest the internal trade. The Central Provinces, Berár, Central India and Rajputána, the Panjáb, North-

West Provinces and Oudh and Haidarabad are the provinces which supply this Presidency with their surplus produce, partly for the use of this Presidency, but mainly for the use of foreign markets. In return for this, this Presidency sends its own surplus produce, and distributes the produce it receives from foreign countries. The following statement shows the chief imports into, and exports from, the Bombay Presidency :—

Imports into Bombay Presidency from Sind and the rest of India.	Maunds.	Exports from Bombay Presidency to Sind and the rest of India.	Maunds.
Cotton (raw) ...	1,774,502	Cotton piece-goods (European)...	477,420
Wheat	11,807,779	Ditto (Indian)...	163,479
Oil-seeds	8,563,808	Coal	336,826
Wool (raw)	51,651	Metals	754,487
Myrabolams	238,083	Sugar	419,079
Opium	77,721	Tobacco	192,369
Other food-grains ...	3,164,376	Salt	2,455,043
Provisions (ghee) ...	92,066	Kerosine oil ...	175,122
		Jute and gunny bags.	292,517

Of the imports intended for shipment to foreign countries the bulk of cotton is received from Berár; wheat from the Central Provinces, Panjáb and the North-West Provinces; oil-seeds and myrabolams from the Central Provinces; and opium and wool from Rajputána and Central India. Of the exports the bulk of coal and jute and gunny bags is sent to the Central Provinces; cotton piece-goods, metals (iron) to the Panjáb, Rajputána and Central India and the Central Provinces; salt, sugar and tobacco to Rajputána and the Central Provinces; and kerosine oil to Berár and the Central Provinces.

Of the 27 million maunds representing the internal trade the chief items are coal largely exported from Bombay for the use of up-country mills and factories and railway workshops; cotton (raw) imported into Bombay chiefly from Gujarát and Káthiáwár; wheat and oil-seeds imported into Bombay, mostly from Khándesh, Násik, Ahmadnagar and from Gujarát and Káthiáwár; and tobacco from Gujarát and Káthiáwár.

The total road-borne trade of the Presidency amounted to 37¾ lákhs maunds, of which 29¾ lákhs were imports and 8 lákhs were exports. Sholápur is the great outlet and inlet through which much of this trade passes to the Nizám's Dominions in the interior.

185. The total cost on account of trade registration amounted in 1884-85 to Rs. 14,826. I have submitted for the consideration of Government the question as to whether the annual expenditure of Rs. 10,000 on account of road traffic should not be discontinued, especially because the statistics compiled by untrained and unsupervised clerks are admittedly untrustworthy (*vide* para. 21 of the Review).

I have the honour to be,

Sir,

Your most obedient Servant,

E. C. OZANNE,

Director of Agriculture.

RAINFALL RETURNS

(Referred to in para. 171).

Khándesh District Rainfall of 1884.

Táluka=	Dhulia, 2 Gauges.		Páchora, 5 Gauges.		Chálisgaon, 2 Gauges.		Pimpalner, 4 Gauges.		Sávda, 1 Gauge.		Bhusával, 3 Gauges.		Nasirábád, 6 Gauges.		Jámner, 2 Gauges.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		
January	0·59	1	0·07	...	0·25	1	0·30	1	...	...	0·30	1	0·28	1	0·24	1	Records available for 8 out of 16 tálukás, and these are, except Pimpalner, the chief cotton tracts. The extensive wheat tracts of the Tápti valley are unrepresented. In the north and west or Dáng tracts of the Sátpudás and Sahyádris the fall is heavy and sure. These tracts are also not represented, except Pimpalner. The fall of the cotton and wheat tracts is uncertain.
February...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
April	...	...	0·02	...	...	...	0·08	1	...	...	0·05	...	0·01	...	...	...	
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
June, 1st half	0·12	1	2·19	2	0·51	3	0·55	2	0·65	1	3·52	2	2·11	2	1·40	2	
Do. 2nd do.	3·53	3	3·16	4	3·39	4	4·03	4	1·53	2	0·65	3	1·23	4	1·63	4	
July, 1st half	7·10	5	5·95	5	8·15	6	4·58	4	10·13	9	4·40	7	5·51	5	5·09	5	
Do. 2nd do.	4·53	10	4·34	9	5·84	10	8·16	12	5·77	14	4·05	11	5·21	13	3·63	10	
August, 1st half...	0·05	1	0·18	1	0·40	2	1·39	7	0.42	3	0·52	1	0·59	4	0·82	5	
Do. 2nd do.	2·41	7	2·90	7	5·13	7	2·54	9	5·25	8	3·26	6	3·50	7	5·50	8	
September, 1st half	4·07	5	4·56	5	6·97	6	6·10	7	6·00	3	5·64	4	4·26	6	3·95	4	
Do. 2nd do.	7·55	10	8·13	10	9·46	11	4·85	8	10·79	13	8·83	11	9·71	11	10·14	10	
October, 1st half	0·52	2	0·09	1	0·36	2	0·92	3	...	...	0·41	1	0·29	1	0·25	2	
Do. 2nd do.	1·52	3	0·69	2	0·69	2	1·28	3	0·20	2	0·54	2	0·55	3	0·16	1	
November	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
December	1·45	2	1·75	3	1·36	3	2·80	4	1·60	3	2·83	3	2·65	4	1·82	2	
Total ...	33·44	50	34·03	49	42·51	57	37·58	65	42·34	58	35·00	52	35·90	61	34·63	54	
Approximate average	23·16	...	28·99	...	24·59	...	25·41	...	23·41	...	26·11	...	30·72	...	29·35	...	

The fall of the year was abnormally large, though less than in the year previous. It was late and scant at the commencement, causing considerable decrease in the area of cotton, the staple of the district. Cotton suffered greatly from heavy rain in September, October and December, especially the late sown cotton from the December fall. Jowári (an early crop here), however, secured very favourable rain, and was far better than bájri, which was injured by rain at harvest. The rabi rain was very heavy, and delayed sowing. The July rain was injuriously heavy. The December rain was harmful to all crops. On the whole, however, the rabi season was good. Oil-seeds (especially linseed) are extensively grown, and linseed yielded well.

Násik District Rainfall of 1884.

Táluka =	Násik, 4 Gauges.		Sinnar, 3 Gauges.		Igatpuri, 2 Gauges.		Dindori, 6 Gauges.		Niphád, 6 Gauges.		Chándor, 2 Gauges.		Yeola, 1 Gauge.		Peint, 1 Gauge.		Málegaon, 3 Gauges.		Kalvan, 1 Gauge.		Nándgaon, 5 Gauges.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		Ins.		
January	0·07	...	0·15	...	0·15	1	0·12	1	0·12	1	0·70	2	0·26	1	0·73	2	0·55	1	0·91	1	0·33	1	No record available for Báglán táluka. The district is divisible into the Desh (or open country) and the Dángs (near the Sahyádris with heavy rainfall and primitive cultivation). The west portions of Násik, Dindori and Igatpuri and the whole of Peint belong to the Dángs.
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
April	0·10	1	0·11	1	...	...	0·10	1	0·09	1	0·04	...	...	...	...	...	0·32	1	...	...	...	...	
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	0·03	1	...	...	...	...	
June, 1st half	0·20	1	0·91	2	1·52	2	1·20	2	1·27	3	0·50	2	0·83	1	0·61	3	0·41	3	4·16	4	0·59	2	
Do. 2nd do.	2·28	7	1·46	4	11·60	12	3·78	8	1·46	4	2·56	5	0·85	3	7·36	11	3·38	4	1·39	4	1·30	3	
July, 1st half	3·74	9	2·99	5	16·16	14	5·39	13	3·21	6	4·03	5	2·66	4	8·00	15	5·95	6	3·14	6	3·71	4	
Do. 2nd do.	17·44	16	9·62	14	45·97	16	20·76	15	6·45	13	4·07	16	3·39	13	32·98	16	2·45	12	7·19	15	2·91	12	
August, 1st half	1·47	8	1·07	10	9·06	15	2·66	13	0·48	4	0·38	3	0·29	4	5·67	15	0·07	3	0·53	8	0·18	3	
Do. 2nd do.	1·98	11	2·75	12	14·86	16	7·73	14	4·11	11	2·74	10	2·07	9	9·83	15	2·81	9	4·48	12	2·47	7	
September, 1st half	2·73	9	2·73	12	13·33	15	8·30	14	2·30	8	2·65	7	1·87	7	11·64	15	3·47	7	2·51	11	3·21	6	
Do. 2nd do.	3·32	9	3·12	11	14·77	13	6·90	13	2·75	6	4·72	11	2·01	9	11·13	15	9·80	11	3·73	12	7·42	11	
October, 1st half	3·42	3	1·20	4	3·08	6	2·38	7	1·64	3	0·65	3	0·20	3	1·01	6	·85	4	4·44	2	0·42	3	
Do. 2nd do.	2·58	5	4·98	5	3·12	5	1·50	5	2·68	4	2·63	4	1·12	4	2·54	5	2·67	5	1·74	4	1·32	3	
November	0·04	...	0·04	1	0·01	...	0·01	...	...	...	...	...	...	...	...	...	...	...	...	...	0·03	...	
December	1·09	3	0·75	2	1·39	3	0·60	1	1·97	3	2·32	3	4·18	7	1·04	2	3·21	4	...	...	1·03	2	
Total	40·46	82	31·88	83	135·02	118	61·43	107	28·53	67	28·49	71	19·73	65	92·54	120	35·97	71	34·22	79	24·92	57	
Approximate average	27	..	21	.	114	..	26	..	18		28	..	22	...	93	...	23	...	32	..	21	...	

Monsoon broke well in third week of June—rather late, and the fall was not sufficient for general sowings till the middle of July. The deficiency of early rain was detrimental to the rice and hill crops of the Dángs as well as to the kharif crops of the Desh. The kharif further suffered from short rain in August. The September rain was good for the rabi sowings, and still more so the October rain; but this was damaging to the kharif crops, especially cotton. The abnormal rain of December no doubt increased the yield of the wheat and other rabi crops where it was not too heavy, but it caused rust and deterioration in quality to wheat. On the whole cotton suffered most.

Ahmadnagar District Rainfall of 1884.

Táluka =	Nagar, 3 Gauges.		Sangamner, 3 Gauges.		Jámkhed, 1 Gauge.		Párner, 1 Gauge.		Kopargaon, 1 Gauge.		Ráhuri, 1 Gauge.		Nevása, 7 Gauges.		Shevgaon, 1 Gauge.		Karjat, 1 Gauge.		Shrigonda, 1 Gauge.		Akola, 2 Gauges.	
	1		2		3		4		5		6		7		8		9		10		11	
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.
	Inches		Inches		Inches		Inches		Inches		Inches		Inches		Inches		Inches		Inches		Inches	
January	0·20	1	0·53	2	0·17	1	0·29	2	0·40	1	0·30	1	0·40	2	0·31	2	...	...	0·24	1	0·11	1
February	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...
March	...	...	0·24	1	...	...	...	...	...	...	...	...	...	...	...	..	..	...	...	...	...	...
April	0·58	2	0·14	1	0·24	1	0·22	1	...	...	...	...	0·25	1	0·17	3	...	...	0·55	1	0·05	...
May	...	...	0·06	...	0·16	1	...	...	...	...	...	...	...	...	0·20	1	...	...	...	...	...	...
June, 1st half	0·08	1	0·37	1	0·92	2	0·22	2	0·40	2	0·30	1	0·94	3	0·48	2	1·79	2	0·98	2	0·47	3
Do. 2nd do.	0·92	3	2·10	5	0·77	5	2·34	3	1·30	3	1·48	3	1·31	5	1·44	6	0·33	2	0·74	3	6·83	11
July, 1st half	0·87	2	1·01	4	2·79	5	2·47	7	1·57	3	0·68	3	0·67	5	0·96	9	1·18	3	0·93	5	9·02	12
Do. 2nd do.	0·87	6	3·70	9	1·72	5	2·76	11	2·98	7	2·04	8	1·05	7	1·17	10	1·64	7	1·77	8	33·82	15
August, 1st half	0·16	1	0·18	2	0·90	5	0·34	7	0·01	1	..	...	0·23	4	0·47	6	...	...	0·22	2	7·59	9
Do. 2nd do.	4·36	5	2·63	4	4·75	7	3·53	8	2·00	5	5·92	3	4·63	7	1·87	5	2·87	8	2·44	5	9·76	13
September, 1st half ...	0·60	4	1·19	4	0·86	4	1·05	8	1·56	6	0·75	4	0·79	4	0·53	5	0·26	2	...	..	13·10	12
Do. 2nd do. ...	5·73	8	3·45	8	5·35	7	2·06	7	2·90	8	3·21	7	3·83	10	2·54	12	2·24	7	1·72	7	6·50	11
October, 1st half	1·43	3	1·62	2	0·33	1	1·22	4	1·35	2	1·07	2	0·75	2	2·30	4	0·26	3	0·29	4	2·57	4
Do. 2nd do.	2 98	4	3·36	5	1·97	2	1·70	7	1·44	3	4·56	5	1·99	4	2·24	5	1·45	4	1·48	6	2·89	6
November	...	...	0·06	0	0·14	1	...	...	...	...	...	...	...	...	..	...	...	...	...	...	0·22	1
December	2·85	7	2·76	5	1·64	4	1·77	4	3·92	5	3·66	5	4·63	7	3·45	7	2·10	3	3·74	7	1·01	2
Total ...	21·63	47	23·40	53	22·71	51	19·97	71	19·83	46	23·97	42	21·47	61	18·13	77	14·12	41	15·10	51	93·94	100
Approximate average...	23	...	17	...	26	...	21	...	18	...	26	...	21	...	23	...	20	...	20	..	21	...

Remarks.

(1) *Desh*—
Godávari Valley (tálukás 5 to 8). Rich alluvial plains, growing much wheat. Rainfall very uncertain. Bhima and Ghor Valley (tálukás 9 and 10) alluvial, but less fertile. Rainfall more capricious. Good year exceptional. Tálukás 1 to 4 lie between these valleys. Alternation of bare hill and treeless plain, with occasional fertile well-wooded tracts. Rain more regular.

(2) *Dángs*—
Half Akola has very heavy rain. Half abuts on the Desh. The record shows the mean fall fairly. It exceeds the average, which is based on returns from the plain portion.

Early monsoon rain scanty and late, specially in Nos. 1-3, 6, 7, 8, where sowings were delayed till the end of July. The early August rain was poor everywhere, and the kharif crops languished. The late August rain revived them, and averted an imminent fodder famine. In September another damaging break was followed by general and good rain, which benefited the kharif and served for timely and general rabi sowing. October rain good. The fall in December, abnormal though it was, increased the rabi yield, though it caused rust to wheat and deterioration of quality.

Poona District Rainfall of 1884.

Táluka=	Haveli, 7 Gauges.		Khed, 2 Gauges.		Purandhar, 2 Gauges.		Bhimthadi, 10 Gauges.		Junnar, 1 Gauge.		Sirur, 1 Gauge.		Maval, 3 Gauges.		Indapur, 5 Gauges.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches		Inches.		Inches.		Inches.		Inches.		Inches.		
January	0 14	1	0·26	1	0 14	1	0·23	1	0·49	2	0·29	2	0·08	1	0·05	1	The district varies from a heavy certain rainfall to a most scant capricious one. Sure rain is enjoyed by the west portions of Junnar, Khed, Haveli and all of Mával. A moderate but regular rainfall characterizes the central belt, while the Bhimthadi and Indápur tálukás are uncertain and irregular like the adjoining tálukás of Sholápur.
February	..	...	..	...	...	...	...	...	..	...	...	...	...	...	...	...	
March	0·16	1	...	...	..	...	0·05	1	...	...	...	...	...	...	...	...	
April	0·22	1	0·19	1	0·46	2	0·16	1	0·70	1	0·06	1	0·44	1	0·15	1	
May...	...	...	...	...	...	.	...	.	...	...	...	...	...	...	...	...	
June, 1st half	0·36	2	1·05	2	0·12	1	0·97	2	0 21	1	0·52	2	0·82	3	0·93	1	
Do. 2nd do.	1·95	7	2·11	9	0·72	4	1·31	4	1·23	8	1·06	5	5·25	8	0·67	2	
July, 1st half	2·71	9	3·19	11	1·62	7	1·40	5	3·75	12	0·85	3	8·82	11	0·84	6	
Do. 2nd do.	11·60	14	8·22	14	5·11	11	4·10	11	9·41	16	2·07	9	23·12	14	1·80	9	
August, 1st half	1·32	8	1·55	11	0·25	5	0·74	3	2·14	13	0·06	1	4·73	9	0·08	2	
Do. 2nd do	3 25	11	2·61	12	1·97	7	2·22	6	2·34	14	3·28	3	9·60	11	1·39	5	
September, 1st half ..	2·22	9	2·09	11	0·43	5	1·09	3	1·96	11	0·11	1	8·81	9	0·46	2	
Do. 2nd do. ...	2·87	10	2·92	8	1·39	6	1·91	7	3·26	9	3·80	8	10·00	9	1·54	5	
October, 1st half	1·63	3	2·85	4	2·12	3	1·14	3	5·01	3	0·61	2	2·75	3	0·55	2	
Do. 2nd do	6·71	6	2·54	6	7 72	6	6·72	5	3·23	6	1·91	7	2·51	4	3·74	4	
November	0·16	1	0·94	2	0·19	1	..	...	0·89	1	...	.	...	..	...	..	
December	1·51	5	1·51	4	0·68	2	2·01	4	3·14	6	1·34	5	1·36	3	1·34	2	
Total	36·81	88	32·03	96	22·92	61	24·05	56	37 76	103	15·96	49	78·29	86	13·54	42	
Approximate average	28	...	23	...	21	...	16	...	22	...	18	...	60	...	17		

On the whole the rainfall was seasonable for the kharif in the west and central belts, but late and deficient in the eastern tracts. Here cotton was scarcely possible, and other kharif crops very poor, the break in August being very harmful. The late rain was favourable to these tracts, and saved them from complete failure. The rain of October (good for the east) damaged the standing kharif crops in the west and central belts.

Sholapur District Rainfall of 1884.

Taluka =	Bársi, 3 Gauges.		Sholápur, 5 Gauges.		Mádha, 4 Gauges.		Pandharpur, 1 Gauge.		Karmála, 5 Gauges.		Sángola, 2 Gauges.		Málsiras, 1 Gauge.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		
January	...	...	...	...	...	...	...	...	0·03	...	0·07	...	...	...	The isolated táluka of Bársi is richest, and has the surest rain; but the rainfall is scanty all over the district, and very capricious.
February	...	...	...	...	0·05	...	0·04	1	...	...	...	...	...	...	
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
April	0·26	2	0·15	1	0·18	1	0·13	2	0·06	1	0·09	2	...	...	
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
June, 1st half	0·16	1	0·20	2	0·82	1	0·09	2	1·63	3	0·19	1	1·85	2	
Do. 2nd do.	0·22	2	0·15	2	0·10	1	...	...	0·46	3	0·05	...	...	...	
July, 1st half	1·76	6	1·19	7	1·21	5	0·53	7	1·56	5	0·53	3	0·96	3	
Do. 2nd do.	2·14	8	1·22	8	1·41	6	0·88	8	1·91	10	1·24	5	1·01	4	
August, 1st half	0·46	2	0·84	5	0·68	3	0·11	6	0·49	4	0·21	1	0·08	1	
Do. 2nd do.	3·05	7	2·08	7	2·56	6	2·82	9	2·84	7	1·81	4	0·95	3	
September, 1st half	1·20	5	0·88	4	1·24	4	0·79	4	0·42	4	0·73	3	0·14	1	
Do. 2nd do.	4·80	8	3·30	11	1·76	6	1·81	10	2·94	8	3·27	7	0·74	3	
October, 1st half	0·75	2	0·92	2	0·60	2	1·78	5	0·85	2	1·37	2	1·21	4	
Do. 2nd do.	3·82	5	6·25	5	2·74	4	2·92	5	3·97	6	3·65	5	2·89	5	
November	0·03	...	0·26	1	0·10	...	0·01	1	0·01	...	0·09	2	...	...	
December	2·54	5	1·30	2	2·29	2	3·52	4	2·01	3	2·55	4	2·53	3	
Total ...	21·19	53	18·74	57	15·74	41	15·43	64	19·18	56	15·85	39	12·36	29	
Approximate average	29	...	31	...	26	...	28	...	24	...	22	...	20	...	

Fall deficient throughout. Little kharif was sown till the end of July. The small area sown suffered so from the break in August that the kharif crop was generally a complete failure. Scarcity of grass and fodder much felt from August till the September rain slightly improved the condition. The rabi was sown on this rain of September, but the much-needed fall of October was very late. It revived the rabi crop, but was inadequate to counterbalance the effect of the previous long breaks. An abnormal rain in December was very beneficial, and saved the district from scarcity. In Bársi and Sholápur the rabi crops were fair; elsewhere poor. The Government forests were opened to grazing, but by the end of December were grazed down.

Sátára District Rainfall of 1884.

Táluka=	Javli, 1 Gauge.		Pátan, 1 Gauge.		Wai, 2 Gauges.		Satara, 3 Gauges.		Koregaon, 2 Gauges.		Karad, 2 Gauges.		Khatáv, 3 Gauges.		Khánápur, 1 Gauge.		Man, 2 Gauges.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		
January	0·21	1	0·45	1	0·21	1	0·11	1	0·16	1	0·13	1	0·12	1	0·09	1	0·05	1	No record available for Válva and Tásgaon tálukás. Under Jávli the exceptional rainfall of the hill-station Mahábaleshvar (average 262 inches) is not included. *N. B.*—General characteristics: *Western Belt.*—Parts of Jávli, Pátan, Wái, Sátára and Válva. Hilly. Regular and heavy rainfall. *Central Belt.*—East portions of above and all Koregaon and Karád. Rich, well-watered valleys. *Eastern Belt.*—The rest chiefly a waving plain and of poor land. Uncertain rainfall. But south portion of Tásgaon rich, well-wooded plains.
February... ...	...	...	...	...	...	...	0·13	...	...	...	...	...	...	...	...	...	...	...	
March	0·03	1	...	...	...	...	...	...	...	...	0·21	1	...	...	...	...	0·16	...	
April	0·90	5	...	...	0 22	2	0·12	...	0·46	2	1·06	5	0·12	1	0·21	1	0·15	2	
May	...	...	...	...	...	...	...	...	...	...	..	...	0·27	2	0·10	1	...	...	
June, 1st half ...	1·39	6	1·82	2	0·24	1	0·90	3	1·31	3	0·73	4	0·52	2	0·30	2	0·08	...	
Do. 2nd do. ...	15·15	15	3·39	7	2·78	13	1·22	5	1·00	6	0·56	7	0·78	4	0·52	3	0·03	...	
July, 1st half ...	26·70	15	7·49	15	4·03	15	1·92	8	1·72	6	2·18	8	1·33	7	1·07	6	0·16	4	
Do. 2nd do. ...	62·92	16	15 60	16	16·91	16	9·22	12	12·53	13	8·02	14	7·22	13	5·71	13	2·98	9	
August, 1st half .	14·69	15	6·28	12	4·89	15	0·99	7	0·83	6	1·43	11	0 48	5	0·60	4	0·17	1	
Do. 2nd do. ..	24·41	16	4·81	15	5·98	15	2·94	10	4·02	12	2·19	14	3·08	11	1·25	6	1·43	6	
September, 1st half	15·53	15	0·80	7	2·78	14	1·36	8	1 21	7	1·21	8	0·86	6	0·77	4	0·34	3	
Do. 2nd do.	16·12	15	1 69	7	2·84	14	2·28	7	1·73	6	1·61	8	1·06	7	1·33	8	1·07	6	
October, 1st half .	2·53	10	...	...	0·13	3	0·41	2	0·85	3	...	...	0·78	3	4·50	3	0·90	5	
Do. 2nd do.	3·62	7	2·50	5	4·13	7	3·32	7	3·72	7	8·54	7	4·31	5	6·50	7	3·64	7	
November ...	0·68	3	...	...	0·28	1	0·36	...	0·06	...	0·01	...	0·01	...	...	...	...	...	
December ..	1·69	10	3·53	3	2·50	6	3·11	6	3·39	5	2·30	4	5·18	5	3·45	2	2·93	4	
Total ...	186·57	150	48·36	90	47·92	123	28·39	76	32·99	77	30·18	92	26·12	72	26·40	61	14·09	48	
Approximate average	72·00	...	65·00	...	38·00	..	40·00	...	27·00	...	27·00	...	21·00	...	24·00	..	21·00	...	

May rain, useful for preparing the land, absent. The monsoon rain began late, and was too light for sowing till the 2nd half of July. This was specially felt in the western and central belts, and tended to a deficiency of early grass, and delayed detrimentally the sowing of early crops. The kharif crops are not so important in the eastern belt. In August rain was favourable; but in September and 1st half of October the want of rain was detrimental to the growing kharif, and delayed the sowing of the late crops. The October rain was very beneficial. A heavy fall in December, though of great use to some rabi crops, is liable to damage the kharif.

Belgaum District Rainfall of 1884.

Táluka=	Belgaum, 1 Gauge.		Sampgaon, 1 Gauge.		Chikodi, 1 Gauge.		Parasgad, 2 Gauges.		Athni, 1 Gauge.		Gokak, 6 Gauges.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches.		Inches.		Inches.		Inches.		
January	0·36	1	0·10	1	...	...	0·08	1	0·05	1	0·15	1	No returns available from the Khánápur táluka. In Chikodi gauging began on 5th May; in Athni it was stopped on 21st January and began again on 18th June. The 5 cents of rain in January in Athni fell on the 16th. Near the Sahyádris the rain of the south-west monsoon is very constant and heavy (Belgaum and Khánápur). Further east, Chikodi, Gokák and Sampgaon, it is fitful. The eastern tálukás show a fitful fall, but this is supplemented by a scanty supply from the north-east monsoon (which comes generally in October and later).
February	0·08	1	0·13	1	...	...	...	...	...	...	...	...	
March	0·09	3	0·05	1	...	...	0·02	...	...	...	...	...	
April	1·85	7	0·79	3	...	..	0·86	4	...	...	1·05	3	
May	0·23	3	...	...	...	..	0·42	2	...	...	0·33	2	
June, 1st half	0·21	3	0·47	3	...	...	1·71	2	...	...	1·25	2	
Do. 2nd do.	1·74	9	0·41	4	0·53	3	1·06	4	0·30	1	0·06	1	
July, 1st half	6·37	14	1·83	8	2·32	2	1·34	4	0·30	3	0·93	3	
Do. 2nd do.	13·69	16	6·72	11	2·44	4	1·67	7	1·15	5	1·22	5	
August, 1st half	5·26	13	1·57	3	2·31	3	0·96	4	0·10	1	0·47	2	
Do. 2nd do.	6·16	15	0·68	4	0·75	4	0·62	4	0·55	4	0·28	3	
September, 1st half ...	1·55	10	0·29	2	0·50	2	0·32	4	3·29	3	0·42	2	
Do. 2nd do. ...	2·12	14	0·21	2	0·60	2	0 14	3	1·66	6	0·73	3	
October, 1st half ...	0·15	3	1·70	2	1·24	1	1·31	2	0·12	2	1·52	2	
Do. 2nd do. ...	3·17	8	2·02	5	2·09	3	5·74	6	1·70	7	4·11	4	
November	0·27	2	..	...	0·38	1	0·01	...	0·39	2	0·09	1	
December	0·73	4	1·22	3	0·80	1	1·07	3	...	...	1·23	2	
Total ...	44·03	126	18·19	53	13·96	26	17·33	50	9·61	35	13·84	36	
Approximate average ...	47	...	23	..	21	...	20	...	19	...	17	...	

The ante-monsoon thunderstorms were good, though insufficient for rice sowing. The monsoon broke late, and sowings were retarded by absence of rain in the 2nd half of June. Rice (Belgaum, Khánápur) was refreshed by the fall of July, which, however, did not extend to the eastern tálukás. In Athni and Gokák rain sufficient for sowing did not come till very late, and large areas were left unsown. Parasgad was hardly better off. The October rain was general and very favourable both to standing crops and for sowing rabi. Scant rain, however, in the eastern tracts left little moisture, and December rain was much desired. It came but too late to allow of a good rabi season. Athni suffered most, and the absence of late rain in rich Chikodi made fodder very scarce. A large area of kharif land was sown in the rabi season, but gave a very poor return. The want of fodder was felt everywhere, except in the west, and cattle were sold for nominal prices in Athni, and many taken to the Gháts for pasture

Bijápur District Rainfall of 1884.

Táluka=	Bijápur, 6 Gauges.		Bágalkot, 6 Gauges.		Bágevadi, 2 Gauges.		Badámi, 2 Gauges.		Hungund, 2 Gauges.		Indi, 1 Gauge.		Muddebihál, 1 Gauge.		Sindgi, 1 Gauge.		Remarks.
Month.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
	Inches.		Inches.		Inches		Inches.		Inches.		Inches.		Inches.		Inches.		
January	0·26	1	0·04	1	0·42	2	0·34	2	0·40	2	...	...	0·26	1	0·59	2	This district receives its rain from both the south-west and the north-east monsoon. Hungund enjoys an even and generally sure rainfall. Bágalkot and Bádámi fare well as a rule. The rich plains of the Krishna and Don valleys are uncertain. The north tálukás of Bijápur, Indi and Sindgi have a capricious and light rainfall.
February... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
March	...	...	0·02	...	...	...	...	...	0·02	...	...	...	0·05	1	...	...	
April	0·23	2	0·60	3	0·26	3	1·10	3	0 45	5	...	...	0·42	5	0·46	3	
May	0·05	...	0·06	1	1·39	4	...	...	0·27	3	...	...	0·20	1	0·18	1	
June, 1st half ...	0·11	1	1·26	2	0·20	1	4·62	2	1·75	3	...	...	1·18	4	0·83	2	
Do. 2nd do. ...	0·32	1	0·05	2	0·38	2	0·11	1	0·44	2	0·60	1	0·43	7	1·52	4	
July, 1st half ...	0·34	3	0·66	4	0·40	5	0·94	3	1·25	5	1·92	2	0·51	7	2·13	7	
Do. 2nd do. ...	1·39	6	1 03	5	1·23	6	2·28	6	1·44	7	1·34	3	1·55	9	1·60	9	
August, 1st half ...	0·35	2	0·11	2	1·64	3	0·20	2	0·39	3	...	...	0·34	4	2·88	7	
Do. 2nd do. ...	0·96	4	1·06	3	1·03	5	1·58	2	0·61	6	1·10	3	1·46	5	2·03	8	
September, 1st half ..	1·43	3	1·06	4	1·10	2	1·46	2	0·63	4	0·59	3	0·15	3	0·62	3	
Do. 2nd do. ...	1·68	6	2·06	7	2·26	6	0 89	5	1·23	7	3·00	10	1·10	7	1·89	7	
October, 1st . half ..	0·85	2	0·59	1	1·34	3	1·32	3	0·22	3	0·54	3	0·24	4	0·80	4	
Do. 2nd do. ...	1·37	5	6·12	6	2·49	5	5·39	7	4·30	9	1·98	6	3·70	5	2·59	7	
November ...	0·05	1	...	...	0·01	...	...	...	0·05	1	0·03	2	...	...	...	...	
December ...	0·29	1	0·74	2	3·34	3	0·29	1	1·23	2	1·39	4	1·21	3	3·70	2	
Total ..	9·68	38	15·46	43	17·49	50	20·52	39	14·68	62	12 49	37	12·80	66	21·82	66	
Approximate average.	23·88	...	22·39	...	27·81	...	24·27	...	23·37	...	27·36	...	23·30	...	26·34	...	

The rain of the year was scant and untimely, especially that from the south-west monsoon. The ante-monsoon showers were good, except in Indi. Kharif sowings began in Bádámi, Hungund and Sindgi with the good fall of July (2nd half), but were retarded elsewhere. Sindgi only got good rain in August. Even Hungund received very little. The kharif season was now over. In Indi, Bijápur, Bágevádi and Muddebihál no khairif was sown, and the sown crops elsewhere suffered severely, except in Sindgi. Fodder and drinking water became very scarce. The cattle were moved to the west. The fall of September and 1st half of October was deficient. Rabi sowing was not general. Prospects were very bad till the heavy rain of October came. Rabi sowings were completed, and extended over much light land, only suitable for kharif. But a long break followed. Some good was secured from the late December rain. Kharif gave a small outturn in Bágalkot, Bádámi, Hungund and Sindgi. Rabi was only fair on the banks of the Krishna and Ghatprabha. In Indi, Bijápur and part of Bágevádi it was a failure. Village inspection was started in the worst tálukás, but, owing principally to the newly opened railway, prices did not rise to famine rates.

Dhárwár District Rainfall of 1884.

Hindu Nakshatras.	English Date.	Hubli, 1 Gauge.		Gadag, 2 Gauges.		Ranebennur, 1 Gauge.		Kod, 1 Gauge.		Remarks.
		Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	Fall.	Rainy days.	
		Inches.		Inches.		Inches.		Inches		
.....	1st January to 10th April ...	...	...	0·11	1	...	...	...	...	Returns from only 4 tálukás out of 11 available. The eleven cents of rain recorded in Gagad between 1st January and 10th April fell on 16th January. The district is composed of hilly tracts,—the maládgrowing rice and hill grains (Hángal, Kalghatgi and Kod), and the black-soil plains growing cotton and wheat (Gadag, Ron, Navalgund and Hubli) or cotton, but no wheat (Karajgi and Ránebennur). The Dhárwár and Bankápur tálukás are partly malád.
Ashvini	11th April to 24th April	1·42	2	0·26	1	0·36	1	0·25	1	
Bharni	25th April to 8th May	0·32	2	0·71	1	1·93	5	1·99	3	
Kriftika	9th May to 22nd May	0·15	1	...	..	0·14	1	...	...	
Rohini	23rd May to 4th June	...	...	0·51	1	0 48	2	...	...	
Mrig	5th June to 19th June	2·12	4	0·50	1	0·27	2	0·55	2	
A'radra	20th June to 3rd July	1·37	7	...	...	0·05	1	1·10	4	
Punarvasu	4th July to 17th July	2·04	7	0·22	2	1·15	5	3·77	10	
Pushya	18th July to 31st July	2·48	10	0 58	1	1·01	2	1·99	7	
A'shlesha	1st August to 14th August ...	0·87	4	1·45	2	1·30	3	2·64	7	
Magha...	15th August to 27th August ...	0·86	3	0·87	2	...	...	1·44	4	
Purva	28th August to 10th September...	1·17	4	...	...	1·13	1	1·21	2	
Uttara...	11th September to 24th September	0·53	1	1·32	2	...	...	...	...	The soil of the malád is red and gravelly, but the rainfall is steady and comparatively heavy. It is more sure and seasonable the further to the west. The proverb says: "Good rain won't give a big crop, nor will bad rain bring famine."
Hast	25th September to 7th October ...	0·29	3	0·29	1	0·63	3	2·00	3	
Chitra...	8th October to 21st October ...	0·73	3	3·28	2	0·35	2	0·86	3	
Sváti	22nd October to 3rd November...	2·38	3	2·19	1	9·33	6	2·67	5	
Vishákha	4th November to 17th November	...	..	...	...	0·24	2	1·79	4	
Anurádha	18th November to 30th November	...	...	...	...	...	...	..	...	This is in comparison to the fertile black-soil plains where with good seasonable rains the produce is very large, but where the fall is irregular and uncertain, and where there is always risk of drought.
.....	December	1 00	1	1·03	2	0·53	1	...	...	
	Total ..	17·73	55	13·32	20	18·90	37	22·26	55	
	Approximate average ...	28	...	25	...	22	...	26	...	

The ante-monsoon rains were light and unseasonable. The kharif rains were also poor. Kharif sowings, including rice in the malád, were much delayed, and in the end were incomplete. The rabi rains also were late and light. The rain of late October (Sváti) improved kharif and rabi prospects, diminished the great water scarcity which had prevailed since April, and enabled the rayats to sow the unsown kharif area with rabi crops. The unseasonable sowing gave very poor results. On the whole, the season was much below average. Rice suffered from want of rain when rain was greatly needed: so jowári. All the rabi (especially cotton and wheat) was late. The cotton and wheat tálukás, the best black-soil, were worse off than the tracts where wheat is little grown, but where cotton is superior and extensively sown. In a separate paragraph the season is reviewed in the light of the current proverbs, which indicate when rain is seasonable for various staples. In Gadag the fall was most unseasonable. The late rains brought up the total a great deal, but even then the fall was much below average, and the late rains were too heavy. It is a pity that other returns are not available.

Note on the Dhárwár Rainfall Return.

The rains may be divided into four great periods :—

(1.) The *Ante-monsoon Rain* valued for preparing the land in the black soil and for sowing rice in the Malád.

(2.) The *Kharif Rains* (from Mrig), 5th June to 14th August, most wanted by the rice and other crops of the Malád.

(3.) The *Rabi Rain* (from Magha), 15th August to 21st October, chiefly needed in the black-soil plains.

(4.) The *Late Rains* needed for bringing on the *rabi*. These at first, *i.e.* from the third week in October, should be very steady and heavy. They should not last long, for if they continue, crop insect-pests and other diseases are brought on the *rabi*, while the ripening *kharif* is much injured.

So the proverbs run :—

'Mrig-panchaka Malládakke, Maghá-panchaka bailshimige' and *'Mriga-panchaka, Maghá-panchaka madasidare mugalige kaikotteno shivaráya.'*

The 5 rains from Mrig for the Malád and the 5 from Magha for the black soil, but if both are accorded I raise my hands in thanksgiving, O God !

The *Ante-monsoon Rains* were light as far as the records show, and unseasonable, as the proverbs seem to indicate. Rain in Ashvini is very unpromising.

"If it rains in Ashvini, water and fodder will fail."

There was rain. I cannot lay much stress on the prognostication, but the facts are that water and fodder were very scarce indeed. From April and May right on to the end of October every report notices the scarcity in the plains, and in the Malád the tanks were dry, even large ones, which had not failed for years.

Bharni rain *"is a lump of gold"* in the Malád—

"If there is abundant rain in Bharni, a cart of rice will sell for a rupee."

There was fair rain as far as the incomplete records show, but taken with the reports, it is clear that there was not sufficient for rice sowing.

Rain in Krittika, as several proverbs say, is most unlucky. There was none in Kod, and it was light elsewhere.

Rohini rain, on the other hand, is eagerly watched for—

"Rohini rain will fill the streets with jowári ; all the roads will be full of rice."

This was absent or very light.

On the whole, therefore, judging by the comparison of the proverbs with the facts, the season looked unpromising, especially for the Malád districts, to which the proverbs chiefly apply.

The Kharif Rains.—The maxims assert that in Mrig there should be steady rain, not sporadic thunderstorms ; that in A'radra rain must come, or the worst results must be looked for—

"No A'radra rain, the crops will fail." "A'radra sets an example, and the other nakshatras follow it."

In Kod and Hubli fair rain in A'radra was followed by better in July (Punarvasu and Pushya). In Gadag there was none, and a miserable fall succeeded in July. In Ránebenhur, however, the proverb appears to have been falsified, as a scant fall of A'radra was followed by good rain in July and August.

The Mrig rain was light; sowings were delayed in some of the rice districts and all over the black soil. The July rain improved prospects, but rice was not all sown till the end of July, and jowári was even then behind-hand, and great anxiety was felt in the black-soil districts. Fodder was scarce. Standing crops were withering, and late crop sowing was retarded.

Rabi Rains.—The proverbs indicate that the Magha rain will give a rich jowári crop, that the absence of rain in Purva means absence of fodder and scarcity of water, that the Uttara rain is as important to cotton and other rabi crops as A'radra to the kharif, that Hast rain will give a fair yield of cereals

and a needed moisture for preparing the land for the late rabi, and that the Chitra rain is very local :—

'It will wet one horn of a bullock and not the other'

and that it is greatly needed for rice. The Magha rains were very scant, Uttara and Hast were very poor. The reports show that rabi sowings were retarded, and the kharif crops suffered from drought.

Late Rains.—The Sváti rain is extolled in the proverbs—

'If in Sváti rain does not come, none afterwards can be hoped for,' 'Sváti rains pearls'.

It is characterized as a very heavy rain. Such were the facts. It came abundantly and generally. The sowing of late crops was completed. The scarcity of water was removed. The kharif crops revived.

Vishákha Rain is reprobated. It brings crop insect-pests and harms the ripening crops. Still more harmful is the rain of Anurádha. The district was free, or nearly free, from these rains, and the close of the monsoon was favourable.

On the whole the season was poor, though better in the kharif than the rabi tálukás. The black-soil plains suffered most. The kharif there was very poor and sparsely sown, while the rabi was late, and only saved by the Sváti rain.

APPENDICES.

APPENDICES.

A.

Examination Papers referred to in para. 23 of the Report.

Paper I.

From the annexed lithographed copy of the rough sketches of a survey number taken from a measurer's rough field book, plot the field to the usual scale. Fill up completely the requisite detailed entries of the fair field book on the printed forms supplied, showing the boundary sketch and calculating the area.

Note.—The number was a difficult one containing two tanks and both rice and dry-crop land. One sketch showed the whole number with the measurements taken in the field; the other, the separate sketch, showing the detailed measurements of the tanks and rice land.

Paper II.

I. A rough sketch of a field is given on the annexed sheet. The measurements taken by chain and cross staff are shown. From these plot the field map to the usual scale, numbering the trapezia, and calculate the area. Show how the calculations should be exhibited in the fair-book form. Draw the boundary-mark sketch, showing on it the mounds and stones required.

II. In the field map on annexed sheet drawn to scale according to the measurements taken in the field state whether any error has been made.

III. Show how to divide this field into two equal parts with the help of the measurements given, showing the dividing line in red ink. Calculate the area of each part. Supposing each part to be a subordinate survey number, show what marks would be required to indicate the division.

IV. In the same field show in black ink what stones and mounds are necessary. Then, supposing that a hedge has been erected on the north boundary and a *sarbándh* on the east, show in red ink what alterations would be caused in the marks, and how on a survey map the existence of the hedge and *sarbándh* would be indicated.

V. By a partition decree a portion of a survey number has to be given to one party. Would the partition necessitate the recognition of the part marked off as a separate survey number? If so, what serial number would you assign to it in the Field Register? Would the partition necessitate any alteration in the A'kárband? Would you erect regular boundary marks? If not, how would you mark the dividing line?

VI. A new road passes through two or more survey numbers. Show how the line of the road should be marked, supposing that the numbers through which the line passes are not to be divided into separate survey numbers, the area occupied by the road being deducted as *pot-kharáb.*

VII. What should be the length, breadth and height of a new mound? And what the length of a new stone? What portion of the length should be under ground? How high should a mound be to be considered in repair? How long and wide should *sarbándh* be to be recognised as a permanent mark?

VIII. By the flooding of a river, the marks of one side of a survey number have been obliterated. How would you replace them? If you suspect that there has been increase of area by alluvion or decrease by diluvion, what steps would you take? Under what limits would an increase by alluvion be liable to assessment? How far would you act on your authority, and when would it be necessary to report for orders?

IX. Show what are the symbols used in survey maps for trees, roads, streams, made roads, footpaths, temples, hedges, houses, and tanks.

X. When for any reason a survey number is re-measured, if it is found that the former measurement was inaccurate, up to what limit would the difference be neglected? If the difference exceeds the prescribed limit, what should be done?

XI. What breadth is generally allowed to a road passing between two survey numbers? How wide is a footpath made? What kinds of roads are deducted as *pot-kharáb*, and what kinds require a division of the lands on each side into separate numbers?

B.

Revised Rules for Recruitment of Circle Inspectors referred to in para. 24 of the Report.

1. Circle Inspectors will be graded on grades of Rs. 30, 35, 40, 45 and 50. These rates will include all travelling allowances within the limits of the tálukás to which they may be posted.

2. About half of the posts will be reserved for survey subordinates, classers and measurers, to be selected as they can be spared on the requisition of the Director of Agriculture by the Superintendents of Survey and approved by the Director of Agriculture. This provision only applies to districts where the survey records may have been handed over to the custody of the Agricultural Department.

3. Subject to this rule, passed Agricultural Students of the College of Science will be regarded as preferentially eligible for appointments as Circle Inspectors as vacancies occur in the establishment of Circle Inspectors, and will ordinarily begin on the lowest grade.

4. The residue of the posts will be filled by selected Revenue Kárkúns chosen principally from the district in which the Circle Inspector Staff is to be introduced by the Collector, and approved by the Director of Agriculture. Such Kárkúns will be placed in a grade apportioned to the rate of pay drawn at the time of transfer as Circle Inspectors.

5. Circle Inspectors appointed under Rules 3 and 4 will be required to study measuring, the rules of boundary marks, &c., if they have not already qualified to the satisfaction of the Director of Agriculture, for three months on half the pay of the grade to which they have been admitted. This period will be extended for three months longer on a subsistence allowance of Rs. 10 per mensem in the case of any Inspector failing to qualify satisfactorily in the first three months. The Director reserves to himself the right of causing a Revenue Kárkún to revert to his permanent appointment instead of allowing him the extension, or, in the case of an Inspector not holding apart from the Inspectorship any permanent appointment, to vacate the appointment unconditionally.

6. A Revenue Kárkún holding an appointment as Circle Inspector may by the Director of Agriculture with the concurrence of the Collector be called on to revert to the regular line if the post is required for a passed Agricultural Student of the College of Science or other candidate trained under Rule 7 or under Rules hereafter to be made.

7. Passed Students of the Agricultural Classes attached to High Schools will be preferentially eligible to appointment as Circle Inspectors after they have completed two years' pensionable service as a Revenue Kárkún, and may notify themselves as candidates to the Director of Agriculture on first joining the Revenue Department.

8. Vacancies caused in the Revenue Department by the appointment of Inspectors will be filled, so far as the Collector finds practicable, by passed Agricultural Students of the High School Classes after provision has been made for any Kárkúns ousted by the reduction in the number of Bhág Kárkúns which may accompany the introduction of the establishment of Inspectors, provided that such Students declare in their application that they intend under Rule 7 to apply for the post of Inspector as soon as they have qualified.

9. The above rules are provisional, and subject to the condition that candidates give proof of good character and physique, and that they know the vernacular of the district where they seek employment.

C.

Exports of Indian Wheat from the Port of Bombay to all Ports beyond the Presidency from 1880 to 1885, referred to in para. 70 of the Report.

Months.	Years.					
	1880.	1881.	1882.	1883.	1884.	1885.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
January	2,927	21,768	85,674	31,019	15,285	41,846
February	1,626	19,275	40,239	25,403	15,933	32,366
March	3.407	20,000	30,557	29,516	14,997	45,824
April	4,985	32,481	30,890	37,503	15,230	38,933
May	17,110	42,428	67,886	76,205	44,831	56,871
June	19,407	52,236	37,190	82,881	54,894	66,602
July	15,055	47,369	19,386	55,921	65,437	33,379
August	7,832	28,172	5,396	32,425	45,546	38,004
September	4,193	35,132	13,797	36,265	30,974	...
October	6,527	48,835	22,317	18,466	19,045	...
November	8,652	76,714	34,159	29,319	28,038	...
December	22,991	48,559	32,703	34,508	27,806	...
Total ...	114,712	472,969	419,694	489,431	378,016	353,825

D.

Proverbs on Cultivation.

1. Work done by one-self is best, then that done by one's son, but worst of all is the work done by a hireling.

2. It is better to till a small field well than a large one badly.

3. One pair of good bullocks is better than 10 bad ones.

4. The farmer who lives out of his field, is like the fish who tries to live out of the water.

5. Drive the plough with one hand and eat your bread with the other.

6. Jowári given for weeding is not lost.

7. A field needs ploughing as much as a house does repairing.

8. There is a crore of rupees buried under the pole of the threshing floor.

9. He is no farmer who fears cold and rain, nor is he a hero who is afraid of a bow.

10. Black soil with patches of *kunda* (a deep-rooted grass) is like a man with itch.

11. Rotation of crops for black soil, but manure for the red.

12. Give me, says the soil, your refuse, and I will give back fresh sprouts.

13. Weed a month after sowing. Your crop will ear a month after weeding, and you may cut it a month after earing.

14. Wash your jowári before sowing as you wash your hands before eating. (This moistening of the seed is to cause quick germination.)

15. A handful of good seed is better than a lapful of bad.

16. Plough in *til* (sesamum) and dig up sweet potatoes. [Both are ways of improving land profitably. In one there is the green manure; in the other, the stirring of the soil.]

Agriculture: Annual Report of the Director of Agriculture, Bombay Presidency for the year 1884-85.

No. 18.

REVENUE DEPARTMENT.

Bombay Castle, 5th January 1886.

Letter from the Director of Agriculture, No. 1645, dated 23rd October 1885—Submitting the second Annual Report of the Agricultural Department of the Bombay Presidency for the year 1884-85.

RESOLUTION.—The range of subjects discussed in this—the second—Annual Report of the Director of Agriculture is very wide. Mr. Ozanne has as far as possible given his best attention to every event directly or indirectly connected with agriculture which occurred in the Presidency in the year under report. This course is the natural result of the importance of the Department, which extends over a large field of operations and makes it difficult for the Director of Agriculture to concentrate his energies, which should not be exposed to an undue strain.

2. In the improvement of statistics, which is one of the most important objects of the creation of the Department, material progress has already been made. The forms suitable for the tabulation of those relating to land and agriculture in this Presidency have been settled and approved by the Government of India, and the Manual of Revenue Accounts is under revision. The statistics of the year under review were not tabulated in the new forms, but those of the Dhárwár District were tested by the establishment of Circle Inspectors, the organization of which was described in the first annual report of the Director of Agriculture, and His Excellency the Governor in Council has learned with satisfaction that greater accuracy has already been observed. In the course of the year a similar establishment was organized in the Bijápur District, but it was for the most part employed in enquiries regarding the extent to which crops had failed. The Governor in Council entirely concurs in the view of the Director of Agriculture that the District Inspector and the Circle Inspectors should aid in compiling the statistics which they test, and that the tendency of Mámlatdárs to employ them on extraneous duties should be at once checked. It appears that a thorough examination of boundary-marks and correction of the maps will at first occupy a large proportion of the time of the establishments.

3. Mr. Ozanne states that the establishments of Circle Inspectors sanctioned for the Dhárwár and Bijápur Districts are adequate, but that the time has come to look to the Survey Department for further aid in supervision. As regards the general question of gradually transferring to the Agricultural Department Assistant Superintendents of Survey no immediate decision is required and the subject is of too great importance to be disposed of in reviewing an Annual Administration Report. His Excellency in Council would however observe that Mr. Ozanne has produced strong evidence to demonstrate the necessity for adopting his proposal. The duties which he enumerates as those which the officers transferred would have to perform are such as cannot and should not be performed by Assistant Collectors. The tendency of Mr. Ozanne's proposal is simply to preserve and continue the excellent work done by the Survey and Settlement Department.

4. Separate reports on the working of the Bhadgaon and Hyderabad Farms, to the re-organization of which Mr. Ozanne has given considerable attention, have been received and will be separately reviewed. His Excellency in Council learns with much satisfaction that valuable results are anticipated from the Nadiád Farm, which is a private institution. The efforts of the public-spirited gentlemen who are co-operating for the improvement of agriculture are very laudable, and the Governor in Council trusts that their efforts will be crowned with success, and their excellent example followed in other places as the result cannot but be very beneficial to the country. The enterprise shown by Mr. Bechardás Veháridás Desái in assisting the measures adopted by Government and in adopting measures on his own account for improving the production and curing of tobacco is also worthy of acknowledgment and encouragement.

5. It is a matter for regret that the efforts made to improve the quality of wheat by the distribution of selected seed were to a large extent frustrated. Most of the seed was damaged by weevils, while the wheat crop in the places in the Southern Marátha Country selected for experiment almost entirely failed and in the Deccan was injured by rust. A successful result was however obtained in the Surat District. The distribution of good seed in a judicious manner will be continued, as this measure more than any other is likely to be productive of visible good results. The superiority of the bájri seed obtained by Mr. Strachan at the Hyderabad Farm by a process of selection continued for several years is said to be very marked and to have attracted the attention of cultivators in the vicinity.

6. The experiment made with cotton seed picked from five-lobed bolls in Dhárwár has not in the opinion of the Director of Agriculture been very successful. In Government Resolution No. 7296, dated 12th September 1884, the Collector was desired to discontinue the collection of seed except for the purpose of investigating the result of sowing four or five-lobed pods and to offer prizes for the best samples of unginned cotton. Steam gin factories have been established at Hubli and Gadag, and it may safely be assumed that the most suitable means of ginning the cotton grown in the Dhárwár District, now that it has been opened up by railways, will be supplied by private enterprise. The Collector should be requested to impress on the Municipalities of Hubli and Gadag the expediency in their own interests as well as in the general interests of the district of carrying out as soon as possible the projects of establishing cotton markets in those towns.

7. The remarks in paragraph 114 of the Report regarding the supply of arrowroot to the Commissariat Department should be communicated to the Military Department for consideration.

8. The Director narrates in detail and with reference to Resolutions of Government the course of gradual development of the means of obtaining improved agricultural statistics. This is useful and convenient for reference while the work of constitution is in progress. He also gives a summary of the discussions which have been going on in the year of report as to improving the export staples—wheat and cotton—and the utility of ensilage in regard to which latter his opinion is at variance with the conclusion reached by Government in the Military Department and must be justified by further experiment.

9. The report contains ample evidence of Mr. Ozanne's activity in dealing with a great number of subjects and special aptitude for the conduct of the important duties entrusted to him in starting a new Department. He has adopted the proper method of careful and patient enquiry. His labours have already yielded practical results, which are indicative of what will eventually be obtained by a continued course of experiment and scientific observation. By the steady

pursuit of a definite object there is a reasonable prospect of the agriculture of the Presidency being substantially improved.

J. MONTEATH,

Under Secretary to Government.

To

The Director of Agriculture,

The Commissioner, N. D.,
The Commissioner, C. D.,
The Commissioner, S. D.,
The Commissioner in Sind,
All Collectors, including the Collectors and Deputy Commissioners in Sind,
The Superintendent, Government Experimental Farm at Bhadgaon in Khándesh,
The Superintendent, Government Experimental Farm at Hyderabad in Sind,
The Superintendent, Botanical Gardens, Poona,
The Survey and Settlement Commissioner,
The Conservator of Forests, N. C.,
The Conservator of Forests, S. C.,
The Conservator of Forests, Sind Circle,
The Accountant General,
The Military Department of the Secretariat,
The Political Department of the Secretariat,
The Public Works Department of the Secretariat, Irrigation,
} With copies of the report.

The Secretary of State for India,
The Government of India.
} By letter.